WIRE AND WIRE PRODUCTS

MAY 1955

Vaughn®

TANDEM MACHINES

"Quick on the Draw!"

FOR ALUMINUM AND COPPER ROD

Vaughn Tandem Machines include both standard and heavy types, meeting dependably a wide range of continuous drawing requirements.

THE VAUGHN MACHINERY CO.

CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

Payoffpak... ®

it's new...it's different... it's ideal for handling and processing WIRE!

PAYOFFPAK—Continental's newest fibre container—offers wire manufacturers and fabricators a revolutionary new development in wire packaging, handling and dispensing.

SAVES WORK—Wire is automatically packaged in the Payoffpak as it is drawn, eliminating such operations as stripping, tying, handling, splitting and wrapping.

SAVES TIME—Payoffpak can hold 600 lbs. Downtime on the wire drawing machine, due to stripping operations, is greatly reduced.

ELIMINATES REELS—Single standard-size Payoffpak eliminates reels and need for wide range of block sizes.

CUTS SHIPPING COSTS—Inexpensive, light-weight Payoffpaks travel for less because of extremely light tare weight.

HANDLES AND STACKS EASILY—In-plant handling of Payoffpaks is easy with conventional hand trucks. High stacking strength means you can use maximum storage space, too.

A survey indicates that often more than 50 labor steps are needed to convert 500 pounds of steel wire in standard eight inch coils—but you can do the same job with Payoffpaks in an average of five operations. No wonder they are calling this new container "the long-playing record of the wire industry" See how Payoffpaks can pay off for you. Call Continental for complete information on this exciting new way to package, handle and dispense wire.

CONTINENTAL CAN COMPANY

FIBRE DRUM DIVISION • VAN WERT, OHIO

New York • Philadelphia • Pittsburgh • Tonawanda • Cleveland • Chicago
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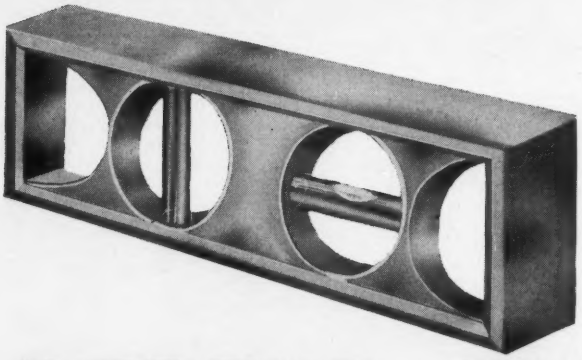
For Production on an even level !!!



DEPEND ON

"America's Finest Wire Drawing Lubricants"

One Hole X Bright 30/33

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3-4-5-6 Hole X-BRIGHT 105-108-110-224-301

MULTI-DRAWING 88-POWDER ALUMINUM & ALLOYS

ALLOYS-ROPE-PROCESS-TIRE BEAD 55 NETTING ULTRA HIGH SPEED High & Low Carbon STAINLESS

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Compact Bundles Greater Frame Capacity 21-WAX Finest on Galv. Wire For Protection

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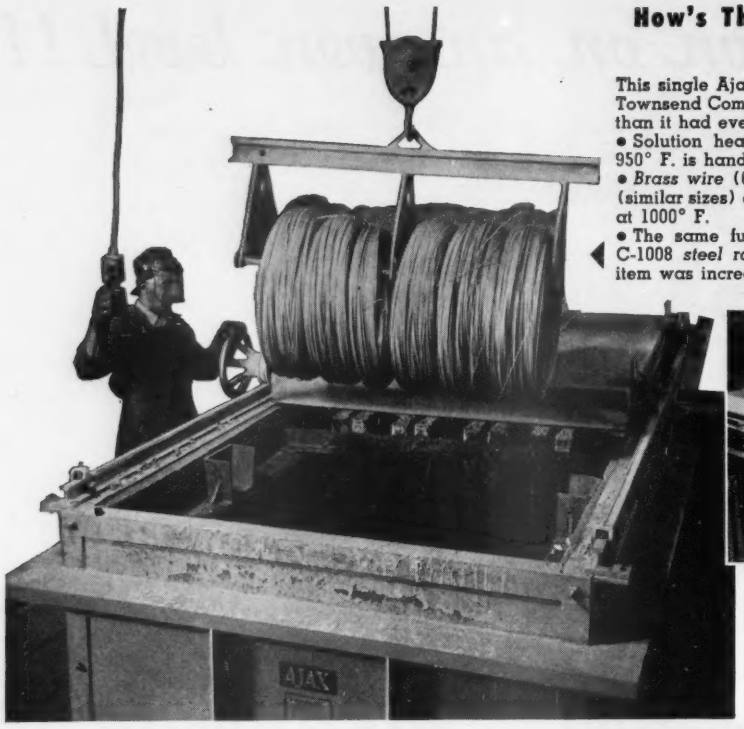
TELEPHONES: Mansfield 6-9324-5-6

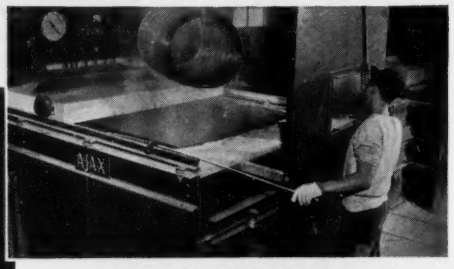
Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.



How's This for Heat Treating Economy PLUS Versatility?

This single Ajax Salt Bath Furnace does 3 different jobs for the Townsend Company, New Brighton, Pa. . . . and does each better than it had ever been done before.

- Solution heat treating of four different *aluminum alloys* at 950° F. is handled at 1,000 pounds per hour.
- *Brass wire* (65-35 from 1/16" to 3/8" diameter) and *copper wire* (similar sizes) annealed in batches of 1,000 pounds in 30 minutes at 1000° F.
- The same furnace is used for stress relieving cold headed C-1008 *steel rods* 1/2-inch in diameter. Production of this one item was increased 400%!



DONE IN MINUTES!

A 250-pound charge of stainless steel wire is quickly brought to annealing temperature of 1850° F. in this Ajax electric salt bath furnace. Wire is essentially used for welding rods.

Save! with SALT BATH HEAT TREATING...the AJAX way!

No other process can match the Ajax Electric Salt Bath Furnace, for speed or low cost of equipment in the heat treating of steel, and non-ferrous wire.

You get greater and faster production in less floor space. Quality is improved—wire is heated more uniformly. Atmospheric effects (scaling and decarburization) are eliminated.

Summing up—the advantages of the Ajax Electric Salt Bath Furnace in specific applications are:

PROCESS ANNEALING . . . Bigger furnace charges heat treated in minutes instead of hours . . . scale eliminated . . . lowest over-all equipment investment . . . smallest floor-space requirement.

DESCALING . . . More work handled in less time . . . greatly reduced metal loss . . . minimized acid consumption by the Du Pont, the Virgo or the "Kolene" process.

PATENTING . . . Faster production with greater product uniformity . . . lower operating costs and, in many cases, the elimination of a separate cleaning operation.

CLEANING, PREHEATING and FLUXING (preparatory to aluminizing or other special processing) . . . Clean, scale-free surfaces obtained more quickly and at appreciably less cost.

Write for case histories—or, better yet, send a representative batch of work to our laboratory for treatment to prove our claims—no obligation.

AJAX ® HULTGREN

Associate Companies: Ajax Electric Furnace Corporation, Ajax Engineering Corporation, Ajax Electrothermic Corporation

electric SALT BATH furnaces

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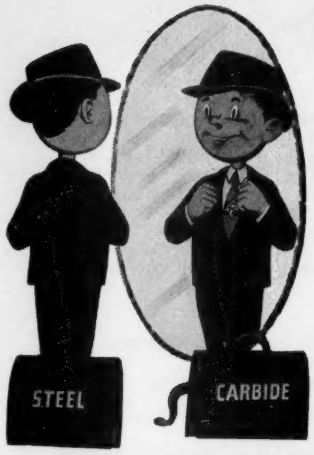

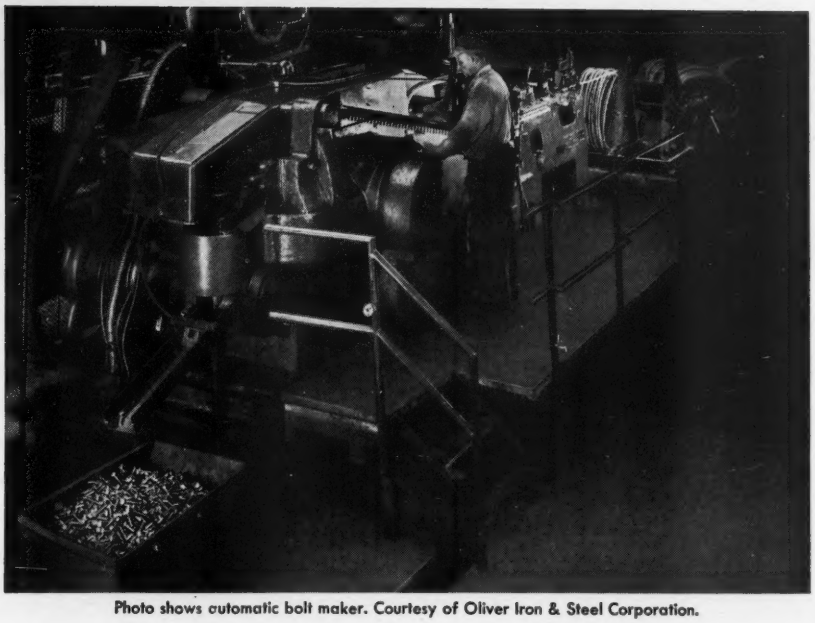

Photo shows automatic bolt maker. Courtesy of Oliver Iron & Steel Corporation.

Mr. Tooley Says:

"It takes two to make a bargain"

How right!

In the field of tools and tooling materials for shaping, forming and removal of metal, Firth Sterling occupies the unique position of supplying *both* steels and carbides to do your job. Thus you *are* always assured of a *bargain* . . . the just-right selection from alternative materials, offered *without bias* from a single source of complete shop tooling.

Cold heading operations, for example, illustrate the point. Either steel or carbide, or both, may be used successfully. But one may have an advantage over the other because of the requirements of the job . . . such factors as quantity of product, geometric design, desired finish, material used and tolerances required. We have *both* steel and carbide. We can recommend the exactly right one, or both, if indicated! Yes, for cold heading "it takes two to make a bargain" . . . Firth Sterling C.H.Q. Steel and Firthaloy Carbide Nibs.

C.H.Q. COLD HEADING QUALITY STEEL

- Controlled hardenability by size
- Controlled carbon content by size
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- Safety in heat treatment
- Superior toughness and fatigue resistance

FIRTHALOY CARBIDE NIBS

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- Toughest grade of sintered carbide
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R-303

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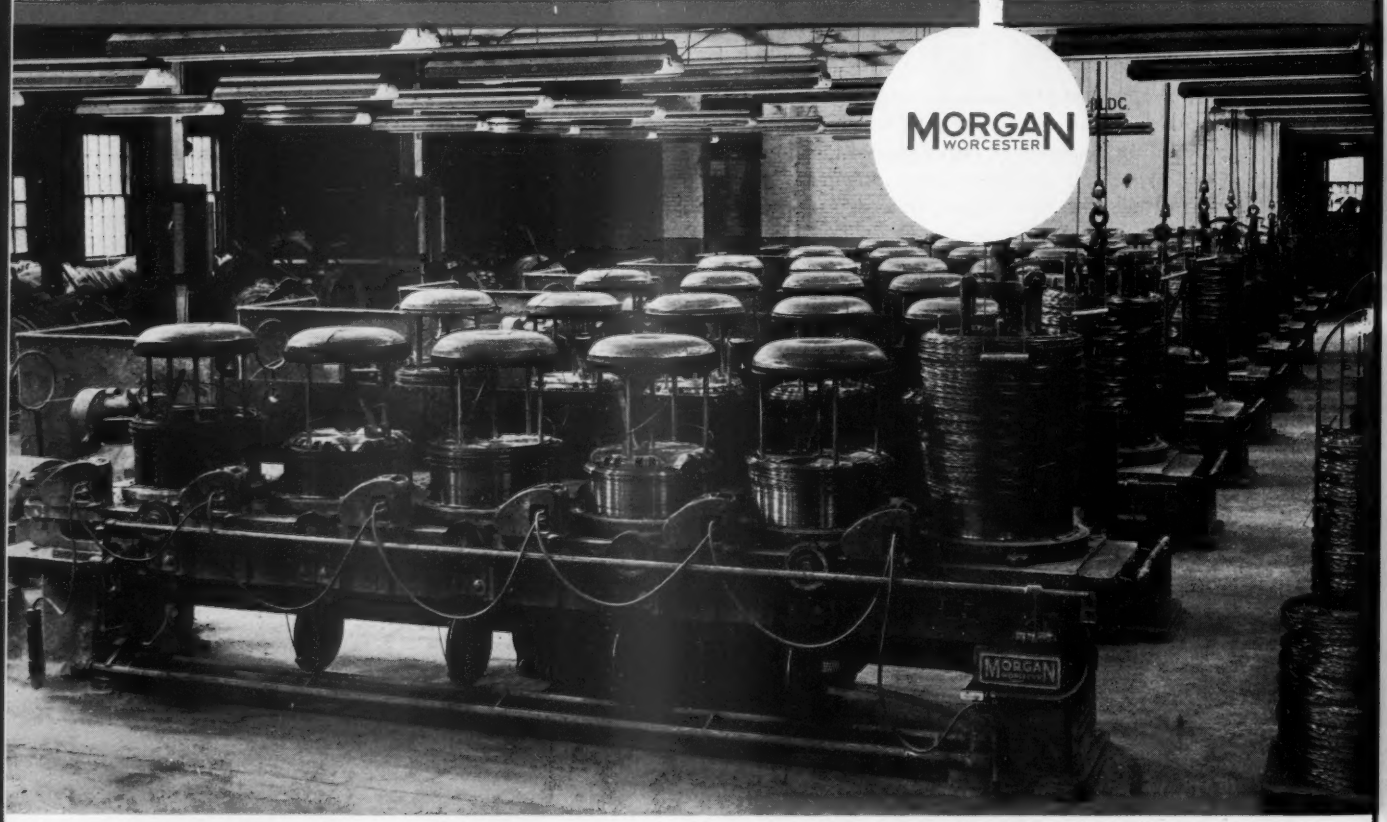
Outstanding Results

Recently we announced the results of a series of scientific tests on the temperatures of wire while being drawn. The tests showed the results of reducing wire temperatures by air cooling to be outstanding.

Recent installations of new Morgan-Connors are confirming—in actual mill production—the results shown by our tests.

Photo courtesy Wickwire Spencer Steel Division, Palmer, Massachusetts



MORGAN-CONNOR
WIRE MACHINES

WM78

MORGAN CONSTRUCTION COMPANY • WORCESTER, MASSACHUSETTS

WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 30 May, 1955 No. 5

Designated as Official Publication By The Wire Association

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WIRE and WIRE PRODUCTS is indexed regularly by Engineering Index, Inc., New York, N. Y.

RICHARD E. BROWN. President and Publisher

R. S. Spengel, Secy.-Treas. & Gen'l. Manager
J. Edward Donnellan, Vice-President

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— ASSOCIATE EDITORS —
Lancaster, Allwine & Rommel, Consultants on Patent Information

Publication Office: Jersey City, N. J.
Executive Office: 453 Main St., Stamford, Conn.
*Reg. U. S. Pat. Off.

WIRE & WIRE PRODUCTS, Vol. 30, No. 5, May, 1955. Publication Office at One Sherman Avenue, Jersey City, N. J. Executive Office 453 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec'y and Treas. Subscription Price: U. S. $8.00; Canada, $8.00 per year; Domestic 75 cents per copy; Foreign 90 cents per copy, except October Convention Issue and January Proceedings Issue, $1.25 per copy; Foreign $10.50 per year. Entered as second class matter at the Post Office, Jersey City, N. J. under the act of March 3, 1879.

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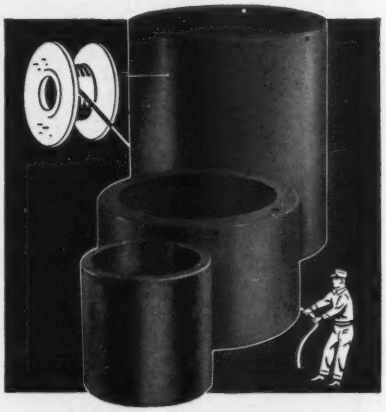

are:

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Made in sizes up to 56-inch diameter and 48-inch traverse—in plain, painted or hot dip galvanized finish—as light as 18-gauge steel. Width of flange and number of bolt and drain holes furnished to your specifications. Available for prompt delivery. Write for prices.

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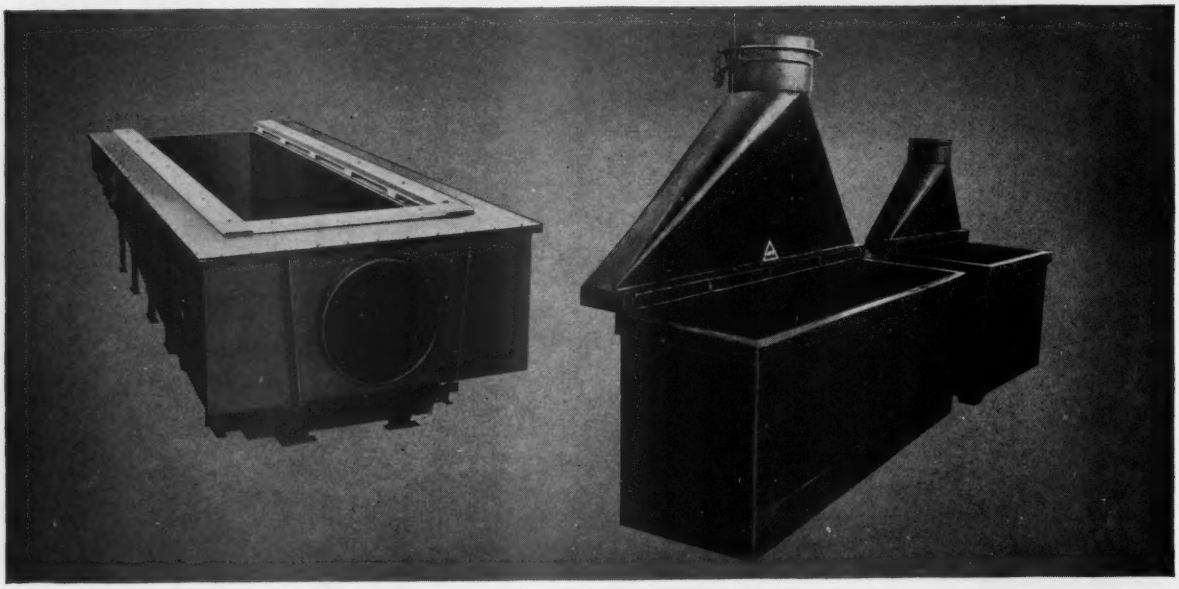

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All Haveg equipment has extra long life, extreme resistance to corrosive chemicals, and can be used continuously in a high range of process temperatures with complete safety.

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Remember, Haveg is not a coating or tank lining. It is a moldable rigid, plastic material made from acid-digested asbestos and specially selected synthetic resins. Throughout its entire mass, Haveg is resistant to most acids and salts, chlorine, practically all solutions used for finishing metals.

Haveg can help you make your finishing operations more profitable and less subject to the waste of corrosion. Call the sales engineer listed and write for 64-page Bulletin F-6 which shows tank sizes, shapes, chemical ratings . . . the complete Haveg story.

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The Torrington Manufacturing Company has built more spring coiling machinery since 1937 than all other manufacturers combined. The knowledge and skill gained while serving spring makers during this period has now been used to create a torsion winder which we firmly believe is the finest ever offered to the industry. If you manufacture torsion springs, this new machine will give you faster, more efficient production and unprecedented versatility to meet your customers' most exacting needs.

Call or write, *now,* for full information.

THE
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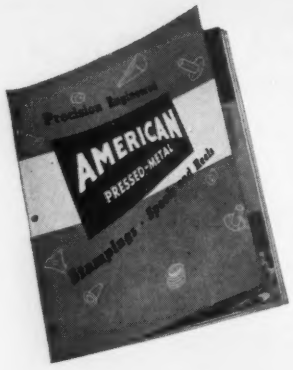
WIRE FORMING MACHINERY DIVISION



Send for your free copy of our latest bulletin on American Pressed-Metal Spools and Reels. It contains full details and charts on the many standard types.

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Name your need . . . there's an American pressed-metal reel or spool to meet it. And if our long list of standard sizes doesn't contain the model you need, we'll custom-build one to your exact requirements.

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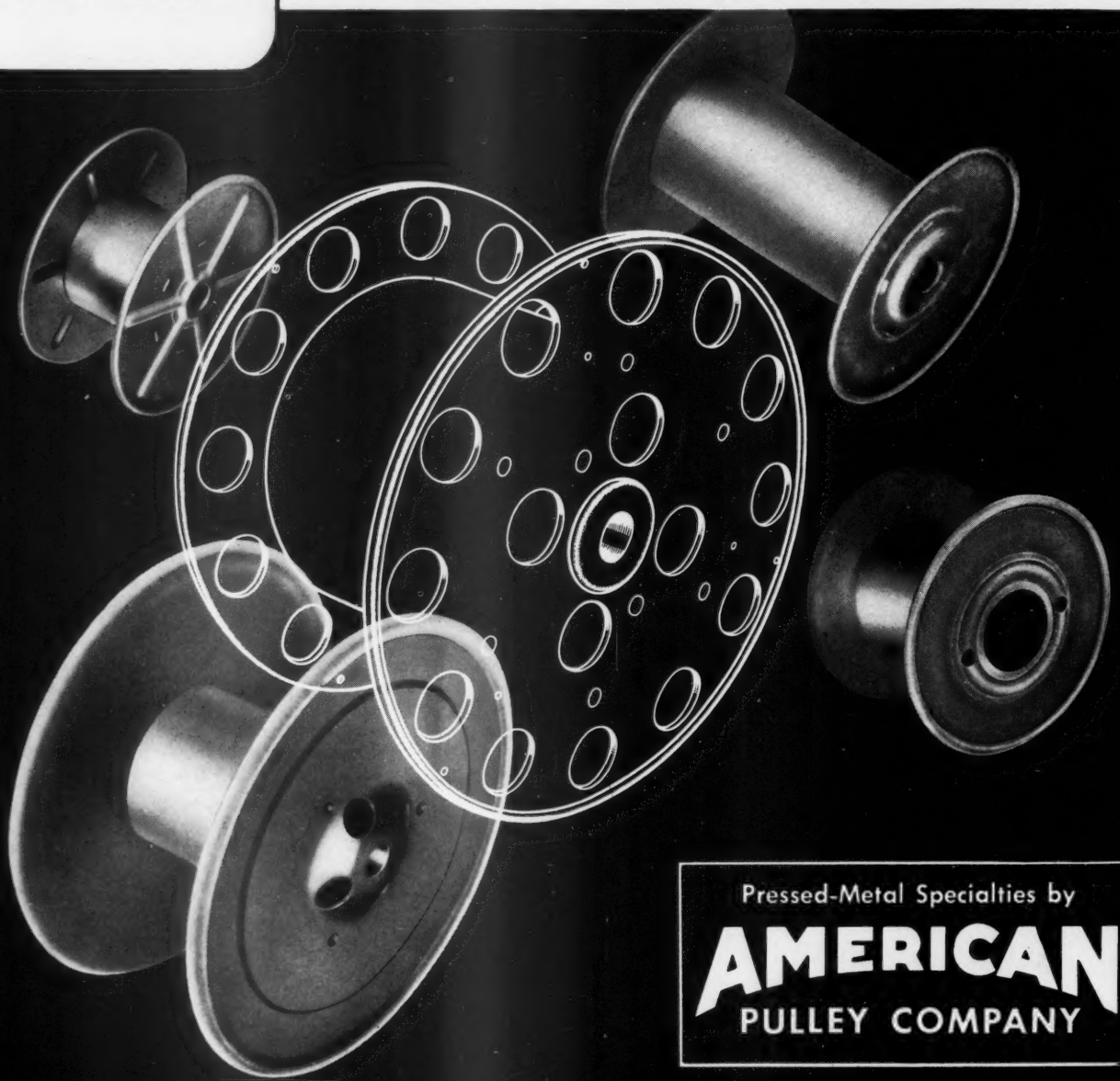
Send us your specifications, blueprints or merely tell us what you need and we'll design from scratch. You'll find our quotations fast, realistic and offering you good value for the money. The American Pulley Company, 4242 Wissahickon Ave., Philadelphia 29, Pa.



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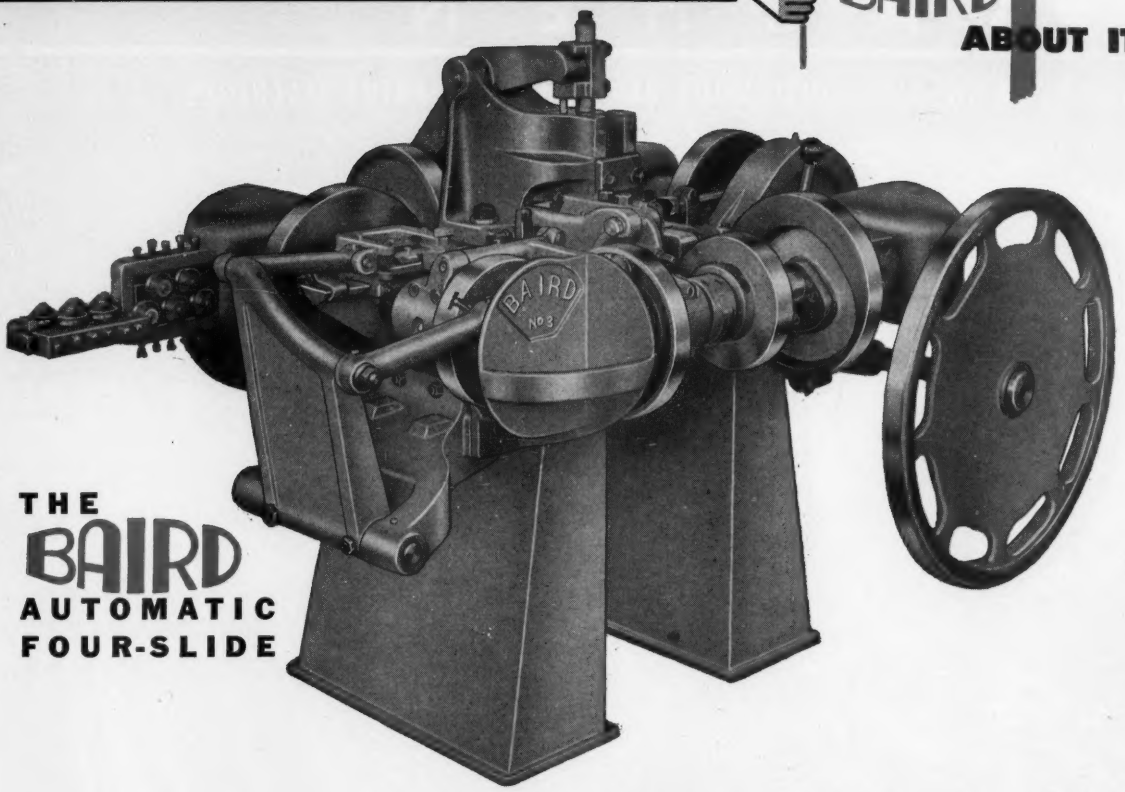

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Baird engineers will develop your tooling from your parts or from blueprints. The Baird Four-Slide Bulletin (Wire or Ribbon Metal) will open new avenues to low-cost competitive production. Your copy on request—write Dept. WP.

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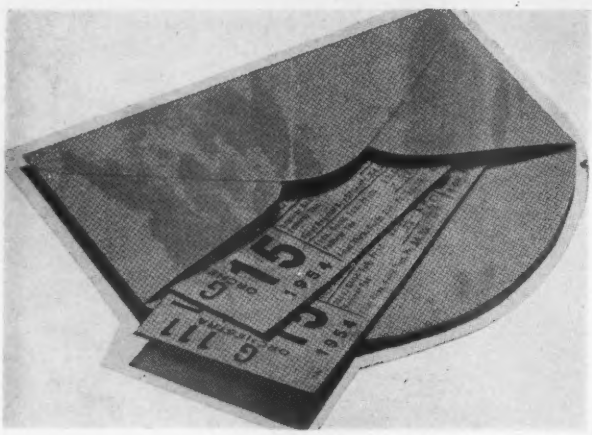

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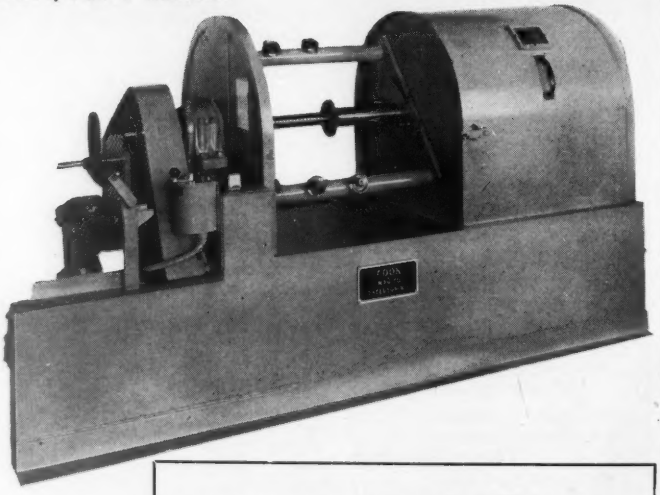

A good example is the new BH-24 BUNCHER-STRANDER illustrated at the right. This new design boasts twice the reel capacity you formerly enjoyed. It saves you money with its long run due to this increased capacity and does this with the same fine concentricity you find in all Cook Bunchers. For a more detailed and satisfying description we invite you to—

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- INTERMEDIATE WIRE DRAWING MACHINE
- HIGH-SPEED ROD MACHINE, MODEL D-17
- TINNING TAKE-UP EQUIPMENT
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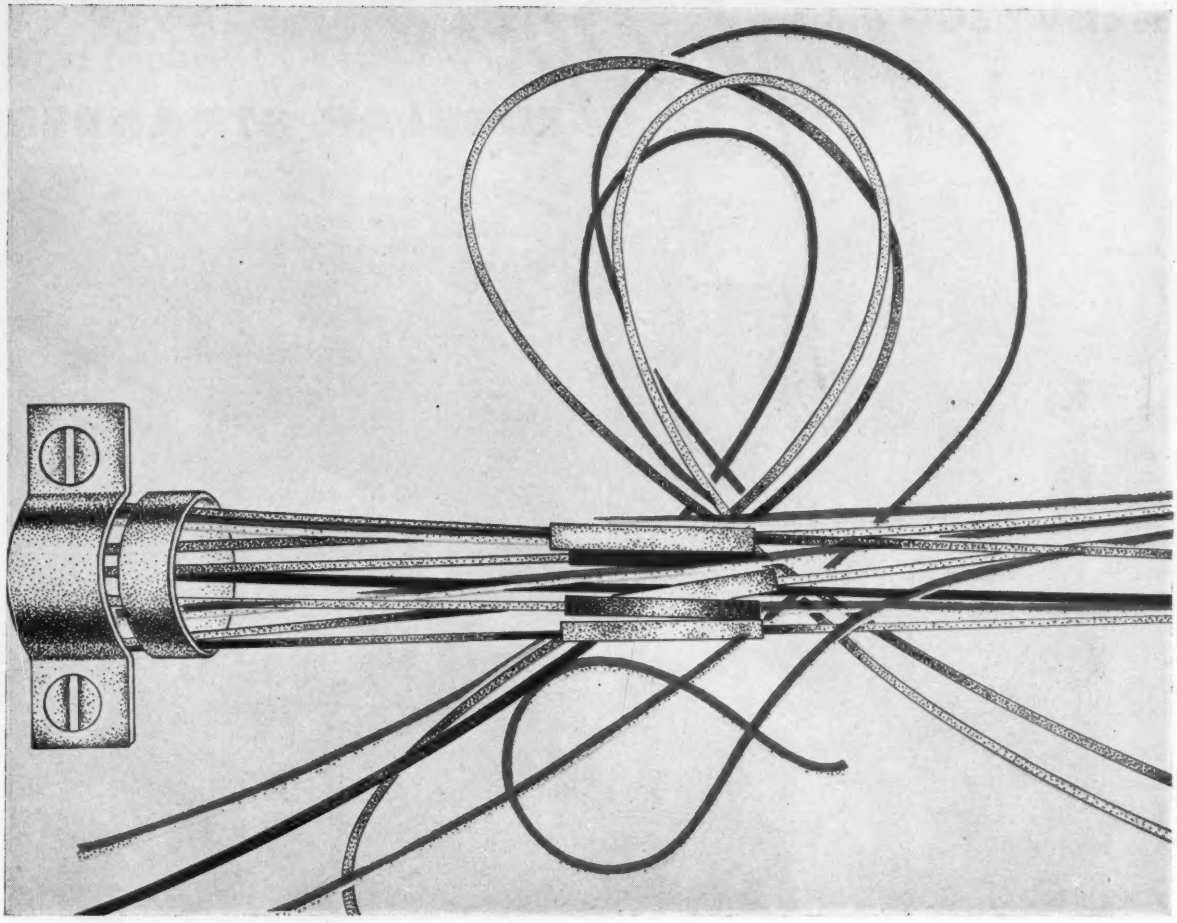
Send for Illustrated Catalog of Above.

Why does man use color



IDENTIFICATION OF PLASTIC-INSULATED WIRE

Red means danger, pink is for girls, purple was royal, the Irish wear green. Color, of course, is an excellent visual means of identification. That is why the electrical industry codes wiring by incorporating various pigments into the plastic insulating material.

Acheson supplies wire and cable coaters with code colors predispersed in the usual coating resins, as well as dispersed blacks for protection against light deterioration.

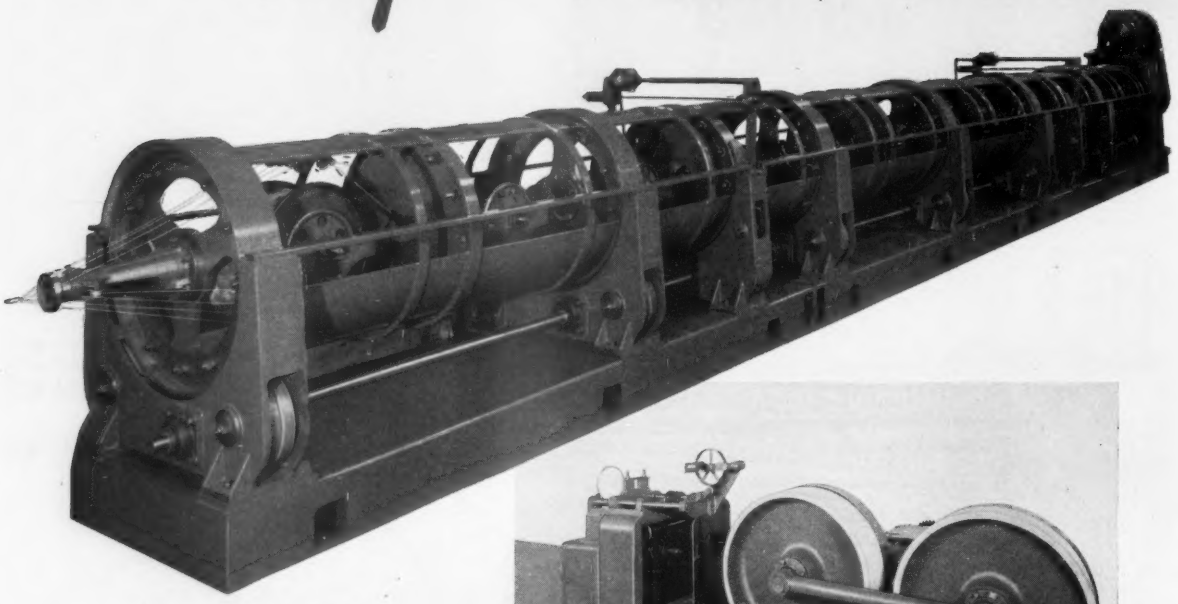
Acheson Dispersed Pigments Co., 2250 E. Ontario St., Philadelphia 34, Pa.
West Coast Distributor: The B. E. Dougherty Co., Los Angeles 21, Calif.
In Europe: Acheson Colloids Limited, Slough, England

ACHESON DISPERSED PIGMENTS CO.

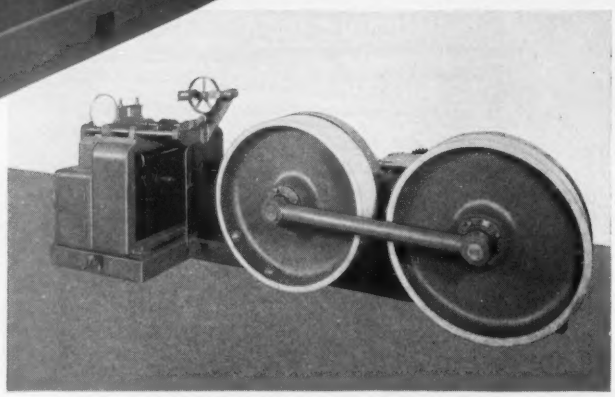
a unit of Acheson Industries, Inc.

DISPERSIONS FOR THE PLASTICS AND PRINTING INK INDUSTRIES

NEBUTTCO *High Speed* TUBULAR STRANDER



12-wire stranding machine



New multi-groove, tilted capstan, both wheels driven

This modern Strander includes many recent developments which increase its production rate and improve the quality of finished cables. Lighter and stronger, it operates at higher speed for stranding or laying copper or steel cables. Regularly manufactured in various sizes . . . for 8", 12", 16", 22" reel flange diameters and in combinations of 7, 12, 13, 19, and 25 reels.

For complete information and prices, write, wire, or phone New England Butt Company, 304 Pearl Street, Providence 7, R. I., or James Day (Machinery) Ltd., 28 Maddox Street, London W-1, England.

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Mastercraft Spring Wire is your assurance of satisfied customers. Mastercraft helps you boost sales and increase your reputation for products that combine comfort, quality and economy.

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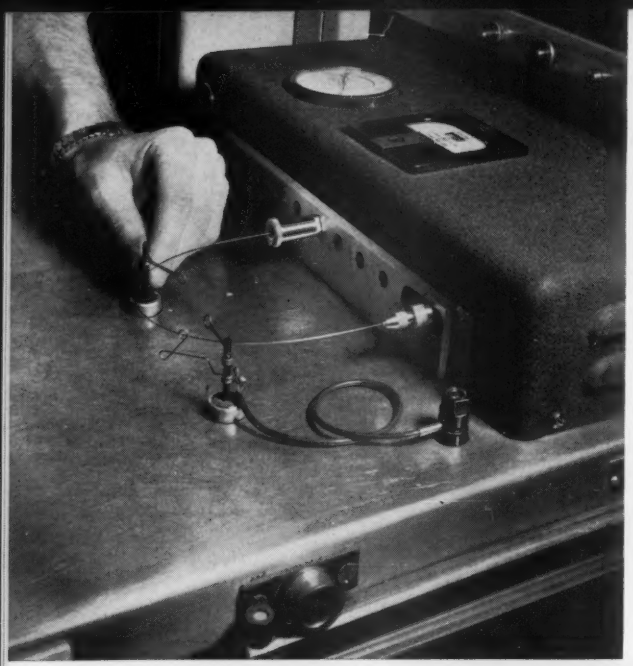
Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

J&L STEEL



Design—Johnson music wire, to be used in a volume control spring for your television set, is looped through a 180-degree arc and rotated through millions of cycles on this rotating beam fatigue tester (left). The spring designed from this wire is then vibrated 50,000 times through its operating cycle (right). Test results enable Hunter engineers to select the most economical wire and spring design for the purpose.

Wire Must be Uniform Where . . .

Accurate Measurement of Quality Shaves Costs On Precision Springs

Cost saving through exacting accuracy in design and production of precision springs is a specialty at Hunter Spring Company.

Over the past 25 years, its plant at Lansdale, Pa., has become a thought-center in the industry. Today, this center is becoming increasingly important to spring development for radio and television, electrical and gas appliances, automotive equipment, controls and hundreds of other applications.

To build springs with the precision demanded at Hunter requires assurance of a continuing supply of special wire with consistent and uniform high quality.

For this reason, Hunter produces a large share of its springs from specialty fine wire supplied by Johnson Steel and Wire Company. Take music wire, for example. Starting with sizes as small as .003 inch in diameter (about the thickness of a human hair), so fine that one pound contains over seven miles of wire, Hunter's requirements range upward to diameters as large as .150 inch.

In production of more common springs, Hunter often starts with Johnson's oil tempered M.B. high carbon spring wire in diameters ranging from .030 to .080 inch. It supplements this range with sizes from .080. to .500 inch, produced by experts at Johnson's parent Pittsburgh Steel Company.

As a measure of the importance of uniformity in the wire, consider the unique methods and equipment Hunter uses to design springs.

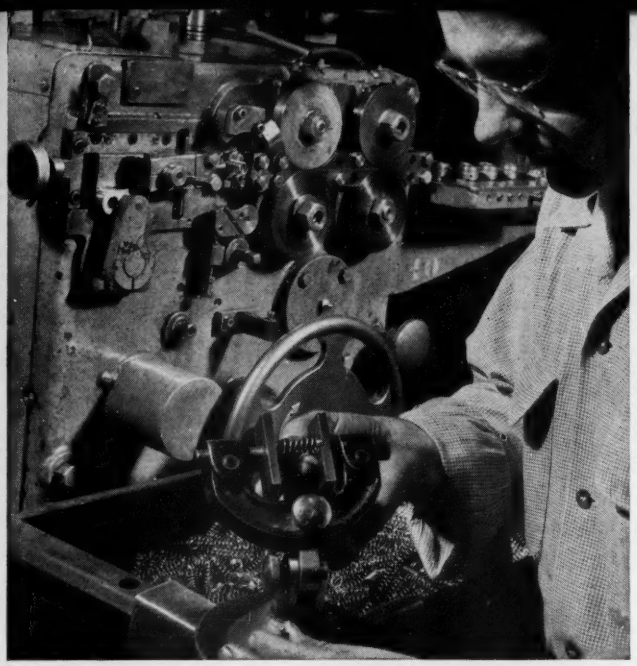
On rotating beam fatigue testers, developed by Hunter engineers, wire samples of predetermined length are looped through an arc and rotated at high speed. Studies of the number of cycles to failure indicate expected wire life in dynamic service. The life of springs made from this wire is compressed into a period of minutes by vibrating the spring through its entire operating cycle at high speed.

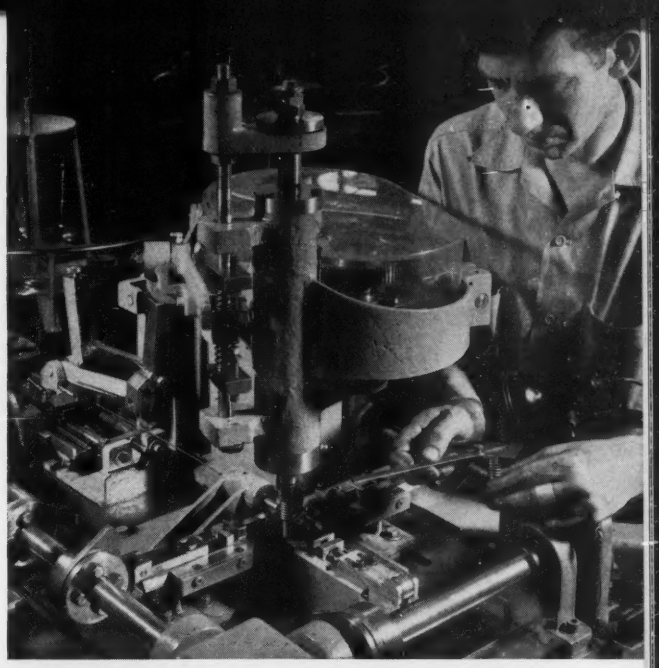
Test results of wire fatigue characteristics are correlated with those for the springs made from it. This enables Hunter to design springs for adequate service at minimum cost. Stress data for a complete range of wire and a wide variety of springs give Hunter research engineers an invaluable basic storehouse of information for economical design of springs. Yet, this information would be practically meaningless without dependable uniformity in the wire they are using.

Scientific quality control only begins with spring design, however. It is followed through with thorough inspection during production operations and a unique system for testing finished springs called "statistical quality control."

Hunter production facilities include modern high speed automatic coiling and torsion machines built to turn out precision compression, extension or torsion springs at machine-gun tempo. Special equipment is used to produce springs in a variety of intricate designs.

Secondary operations encompass grinding-of-ends on compression springs, forming-of-ends on tension or torsion springs, heat treating to relieve undesirable residual stresses





Production—Compression springs for high-quality locks made from .040-inch diameter Johnson music wire fly from this standard Torrington W-11 coiler at rates up to 5,000 an hour (left). The new Torrington No. 1 torsion machine equipped with multiple slides (right) is producing intricate refrigerator motor mounting torsion springs from .076-inch diameter music wire at rates up to 7,000 an hour. Each spring is precision built to exceed the life of the motor.

after cold working and plating or coating to resist corrosion—all accomplished on efficient up-to-date operating facilities.

To be scientifically sure that all of these factors, from the testing of wire through the design and production of springs, add up to the exact spring required by the customer, Hunter researchers now go to work again. Equipped with a complete line of testing apparatus for checking loads ranging from a few milligrams to 20,000 pounds, they test each shipment by (1) 100 per cent inspection, or (2) scientific sampling.

Delicate load testing equipment, for example, checks the amount of deflection in each spring. The piece-to-piece variation pattern in each shipment is sent to the customer in the form of a "statistical quality report." This report reduces inspection costs at the receiving end, provides a basis for decisions leading to changes in tolerance specifications, and assures the customer of receiving springs built for maximum performance at lowest cost.

Obviously, the success of this entire system is predicated on consistently uniform quality in wire from coil to coil and from shipment to shipment, even though the shipments may arrive at Hunter many months apart. To supply Hunter, Johnson Steel and Wire Company has geared production and testing techniques to meet these quality standards.

Do you use any of these specialty wires: Aircraft Cord, Armature Binding, Belt Hook, Bobby Pin, Brush, Gutterbroom, Card, Heddle, Shaderoller, Flexible Shaft, Hose Reinforcement, Hose, Mandolin, Piano, Rope, Safety Pin, Special Shaped, Staple, Metal Stitching, Signal Corps, Oil Tempered or MB Hard Drawn, Music Spring, or Tire Bead?

If so, why not take advantage of Johnson's long experience and modernized equipment to fill your requirements with quality wire you can depend on for uniformity? A call to our closest district office today will bring prompt attention!

Testing—Here delicate extension springs made from .009-inch diameter Johnson music wire to be used in record playing machines, are load tested. Under an initial tension of 8.44 grams, each spring is permitted a variation tolerance of only 1.23 grams (the weight of two paper clips). The variation pattern is sent to the customer in a statistical quality report.

Johnson Steel & Wire Company, Inc.

Worcester 1, Massachusetts

PLANTS: Worcester • Akron • Los Angeles **WAREHOUSES:** Worcester • Chicago • Los Angeles

a subsidiary of **Pittsburgh Steel Company**

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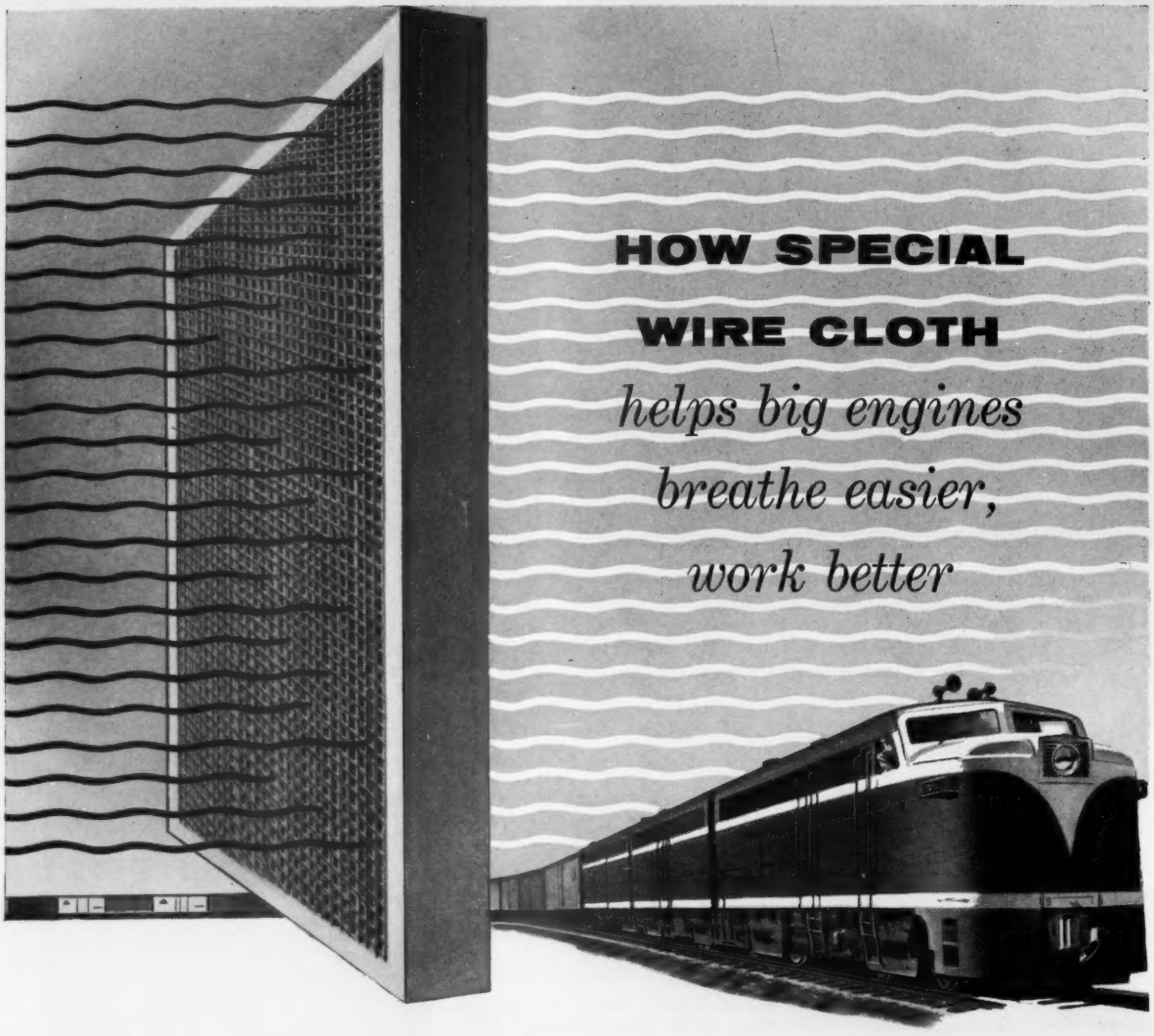

HOW SPECIAL WIRE CLOTH *helps big engines breathe easier, work better*

● Keeping harmful grit and dirt out of the lungs of big engines, like locomotive diesels, is no small problem. Determined to do the job better than ever before, a leading filter manufacturer turned to the *Reynolds Wire Division* of National-Standard for a special wire cloth that would trap all the dirt and still let such engines breathe the terrific volume of air they need.

No simple assignment this, for it took months of concentrated development work—not only to develop the *kind* of wire cloth that would do the job, but also to find out *how best* to produce it. It had to be slit into narrow widths, with special lock wires to prevent raveling. It had to withstand a patented method of severe forming and crimping without compacting. And despite the special construction and narrow slitting, it had to be furnished in extra large continuous rolls. All were tough problems to lick!

The *ability* to lick a tough problem in wire cloth is one thing. The *willingness* to do it is quite another. You get *both* at Reynolds Wire. But, problem or no problem, short orders or large volume production, you too will find it pays to turn to Reynolds. Try us and see.

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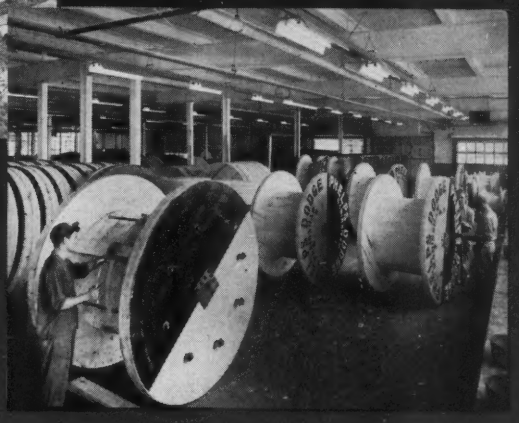

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Carbide wire-die user reports . . .

Carboloy R-3 Die resized 20 times

Original Carboloy R-3 Die with .025″ starting hole. Normal maximum is .182″.

Carboloy R-3 Die after 20 resizes. Final hole is .236″ – 30% larger than normal maximum.

STARTING hole size on the Carboloy R-3 Wire Die, above, is .025″; the normal maximum is .182″. But our Carboloy customer successfully reground the R-3 to .236″ . . . 30% over maximum. Even after the twentieth resize, his wire had the same high quality and precision finish.

Longer die life and superior performance, due to Carboloy built-in quality, are but two of the money-saving "bonus" benefits you get – at no extra cost – with every Carboloy® cemented carbide Wire Die.

Others include: Immediate local delivery, in-plant engineering assistance, die servicing and finishing facilities, technical literature, and die training school for your personnel. Call in an expert Carboloy Wire Die Engineer, today. Or, write for Carboloy Die Catalog and Service Manual.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
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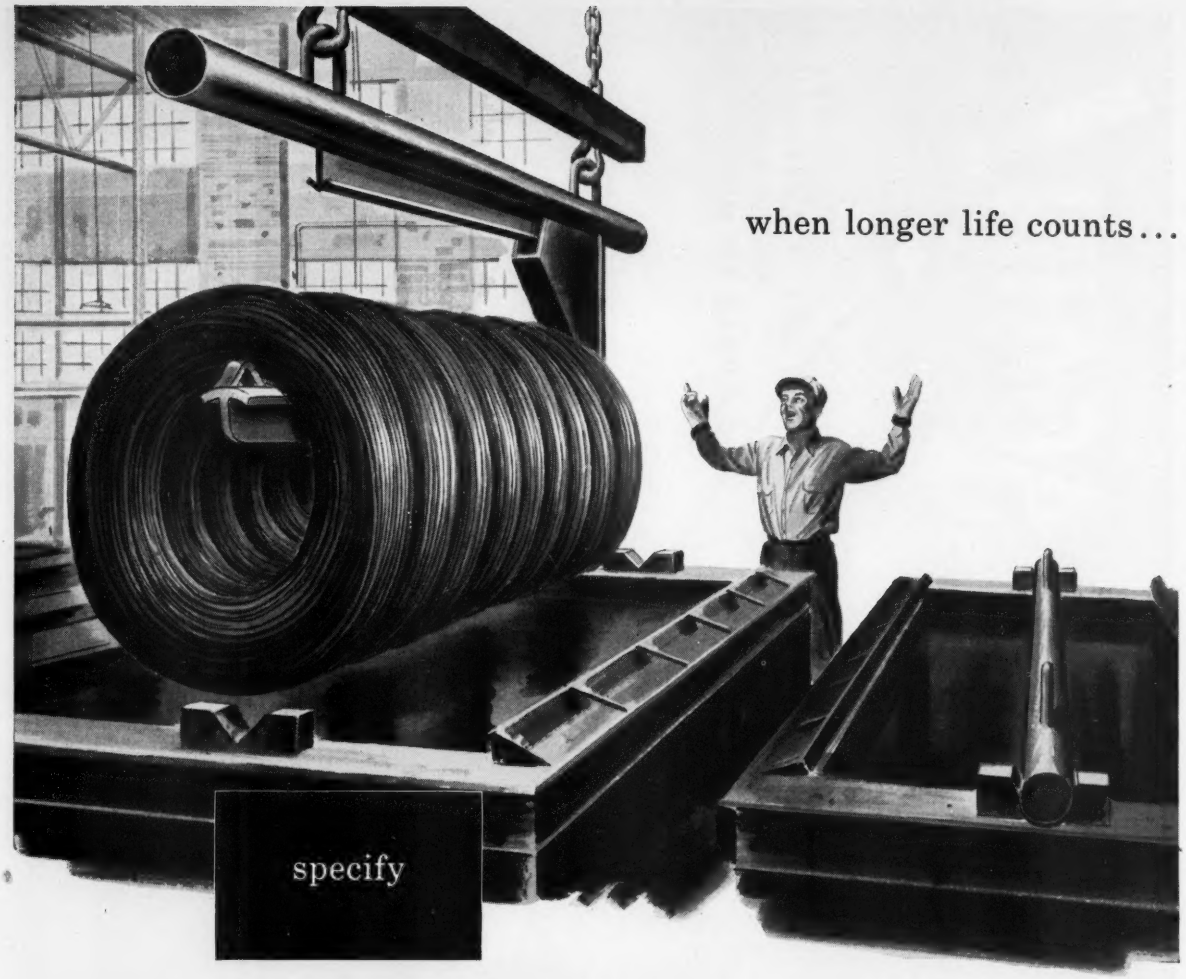
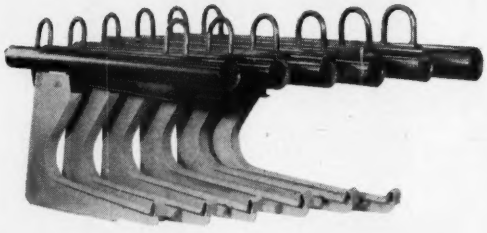
Carboloy Created-Metals for Industrial Progress



MONEL PICKLING HOOKS by LEWIS



STANDARD MONEL AND STEEL UNITS
Are available in two types of construction and six sizes for a wide range of application.

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For extremely corrosive conditions can be supplied on order in a range of sizes.

Designed for tough jobs . . . dependable performance . . longer service life, LEWIS acid-resistant Monel hooks give you substantial savings in maintenance and replacement costs.

Standard units feature an extra ¼-inch of metal on the part to be immersed in acid. In addition, the Monel hooks are bolted to low-cost steel spreader bars that can be replaced quickly and economically whenever necessary.

Another feature of LEWIS pickling hooks . . . important in cleaning operations . . . is a specially-designed drip trough on the load bar that picks up the condensate and carries it out beyond the bundles.

The winning combination of extra-heavy construction and low cost makes LEWIS Monel hooks your best buy for a wide range of pickling applications.

Write today for complete details and prices.

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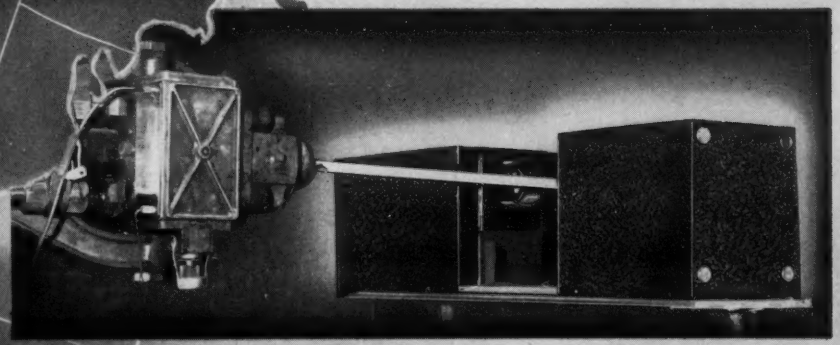
NON-CONTACT – Put it at the Take-up or near the Extruder

FUMES? – Don't worry about that - we've licked that too!



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Outstanding quality is run-of-the-mill with Chase wire. Its dimensions are micrometer-accurate, perfectly round. No physical defects mar its beautiful uniformity of surface, color and texture.

Get the *exact* kind of brass, copper and bronze wire you need. Get it *when* you need it—as *fast* as you need it. Just call the Chase warehouse near you.

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We've stressed so often the fact that in wet drawing non-ferrous metals, Nopco Durpon Drawing Compounds last *twice as long*, and cost no more...you may have overlooked the fact that Durpons also mean *much longer life for your dies*. Which factor makes for the *biggest* saving, we hardly know. Both are well worth having.

The reasons for this long life are two: a buffer which prevents the breakdown of the emulsion, and a sequestering agent which keeps the bath *clean*. Try these money-saving compounds and see for yourself. Mail the coupon today.

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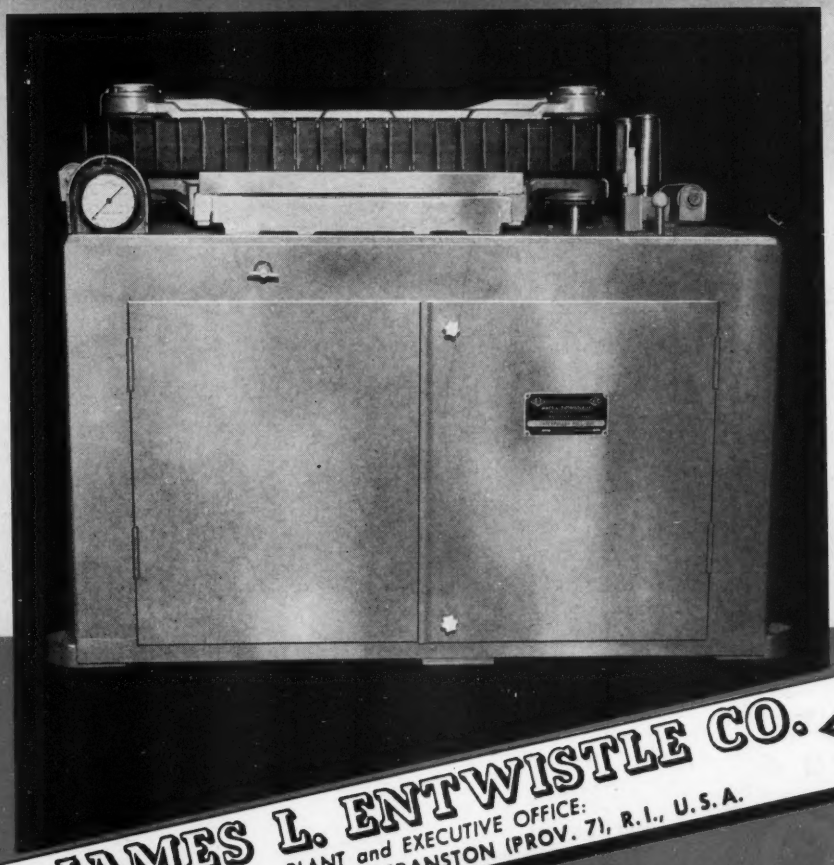
DESIGNERS OF WIRE MACHINERY



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FEATURES

- Quick opening, pneumatically operated treads receive cable. When closed, treads automatically apply any desired tension to cable.
- Air Cylinder applying tread tension is equipped with bleeder which allows variations in cable size to pass through without increasing pressure.
- Replaces and obsoletes capstan wheels as it does not bend or damage cable.
- Ruggedly constructed and completely enclosed; considerably reduces floor space required.
- Horizontal design makes loading easier, and is better adapted to higher operating speeds.
- Pressure on treads infinitely variable by means of air control valve to obtain pulling force needed.

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of the submerged type
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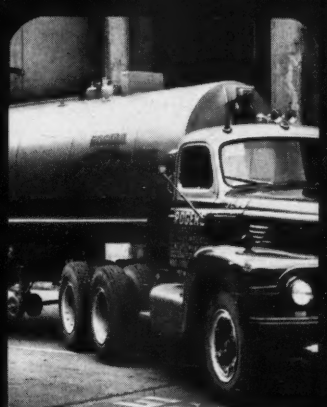
Monsanto PLASTICIZERS speed up processing, reduce production costs!

MONSANTO PLASTICIZERS FOR VINYL-COATED WIRE

TYPE WIRE	RECOMMENDED MONSANTO PLASTICIZER	ADVANTAGES
Type T and TW 60°C. UF-NMC Jackets	DIDP	Volatility ½ of DOP Higher extrusion rate Superior water resistance Good electricals Low pound volume cost
	DOP	High volume resistivity Excellent uniformity of quality Standard of the industry Good electricals
SPT (lamp cords, etc.)	Santicizer S-160	Low-cost primary plasticizer Good electricals Fast extrusion rate Improves compatibility of secondary plasticizers
	HB-20	Low-cost secondary plasticizer Good color Good electricals
80°C. appliance wire 90°C. appliance wire	DIDP	High retention of elongation after extended heat aging Good electricals
	TCP	Flame resistance Low volatility Grease resistance

Fast processing and uniform quality are obtained with Monsanto plasticizers.



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SANTICIZER: REG. U.S. PAT. OFF.

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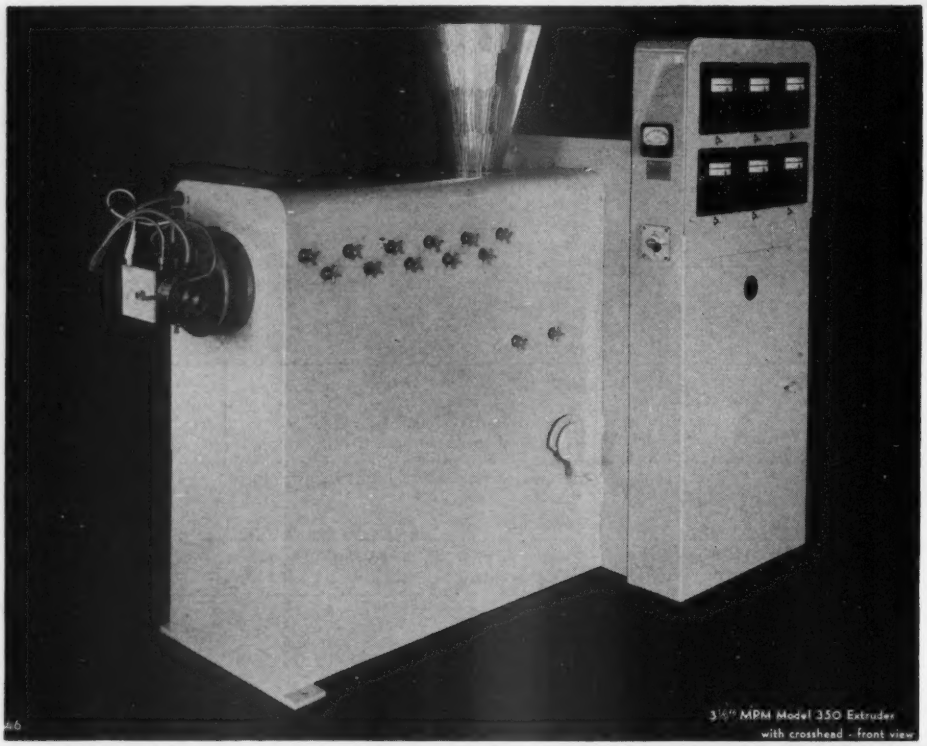
SERVING INDUSTRY...WHICH SERVES MANKIND

"Modern" INSULATING EQUIPMENT

is designed for those electric wire manufacturers who demand the best in extruders.



Shown at left: 3½" MPM Model No. 350 Extruder with crosshead, front view.

MPM Extruders are used by nearly all material suppliers, by laboratories for quality testing, and for production. One large electric wire manufacturer now has 17 MPM Extruders-reorders for them indicate the satisfaction they give.

MPM Extruders have the utmost flexibility and will handle a wide range of compounds and cross sections, as they are equipped with the best in temperature controls.

Literature upon request with questionnaire to determine the sizes, types and production requirements. MPM equipment is used in all principal foreign countries, indicating flexibility with many compounds.

Complete line of accessory equipment, such as dual take-ups, capstans, spark testers, measuring units etc.

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Developed specifically to meet modern production demands, Syncro Eliptube* tubular stranders assure high speed production with uniform high quality.

Widely used for production of ACSR—Copper and Steel strand, various models available to accommodate standard size bobbins. Consult us for any stranding requirement.

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Story of a man who spent all night in the kitchen

(or why use ELGIN Diamond)

Henry was on cloud seven the night of the party. For weeks he'd planned and prepared, checked and double checked. Nothing would go wrong . . . not with old Henry at the helm. And sheer genius, Henry, inviting the boss. Now you're sure to get the raise . . . maybe even a promotion. When the first guests began to arrive, it started . . . Henry mixing drinks, that is. Henry mixed and served – served and mixed and then mixed some more. Afterwards – everyone said they had a perfectly marvelous time, but, wasn't it too bad that poor Henry had to spend so much time mixing things. Ah, yes – poor Henry spent all night in the kitchen . . . mixing . . . missed his own party.

Henry has another party coming up real soon and things are going to be different. You see, Henry's boss told him about ready-mixed drinks. They're much more convenient, save you time and cost less, too. The boss also explained that now-a-days lots of things are ready-mixed. Take for example, the Elgin Diamond they used at the plant for polishing.

"Right", said Henry – grabbing the ball and running with it. "With Elgin Diamond, there's no troublesome mixing or special grading, no expensive waste or chance for error. And our polishing results are consistent, too, because Elgin diamond particles are permanently suspended in a specially formulated, color-identified vehicle. "Bully, Henry, bully", cried the boss.

If your company doesn't now use Elgin Diamond, why not slip your boss the word? Good things always seem to happen when you use Elgin Diamond.

ABRASIVES DIVISION

Dept. G

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

ANOTHER IMPORTANT MEMBER OF WATERBURY-FARREL'S LINE OF WIRE-WORKING MACHINERY

HOW THIS WATERBURY-FARREL WINDER puts trolley wire in its place

This new Waterbury-Farrel Trolley Wire Winder has an automatic, hydraulic, spool-traversing feature that assures a very accurate lay of wire.

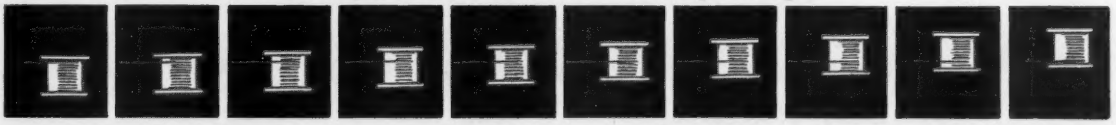
The wire moves straight ahead while the spool itself traverses. It moves across the path of the wire at exactly the right pace to put the wire precisely where it belongs on the spool. A special slip friction device compensates for the build-up of the spool.

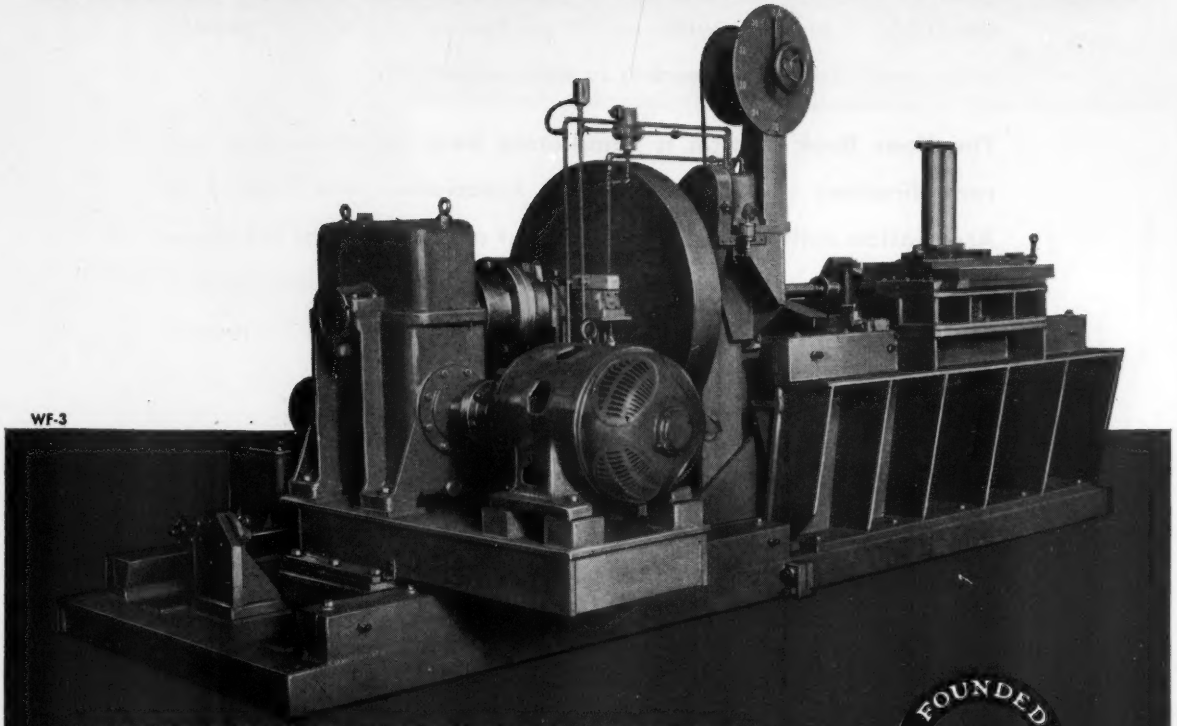
This machine can be furnished to take spools up to 56" O.D., 31" barrel with a 26" traverse. It has a maximum capacity of 7,500 lbs. of wire plus approximately 1,800 lbs. for the spool . . . a total load of 9,300 lbs.

Further information on this machine or on any of the equipment indicated below is available on request.

WATERBURY FARREL FOUNDRY & MACHINE COMPANY
WATERBURY, CONNECTICUT, U. S. A.
Sales Offices: Chicago, Cleveland and Millburn, N. J.

The spool traverses . . . the wire stays straight





WF-3

A FEW OF THE MANY TYPES OF METAL WORKING MACHINERY MADE BY WATERBURY FARREL

WIRE MILL EQUIPMENT—Continuous Fine Wire Drawing Machines • including Upright Cone and Tandem types • Bull Blocks • String-up Machines • Spoolers, Etc. • *COLD PROCESS BOLT AND NUT MACHINERY*—Headers (all types) • Re-headers • Trimmers • Thread Rolling Machines • Slotters • Nut Tappers, etc. • *POWER PRESSES*—Crank • Cam and Toggle; also Rack and Pinion Presses • Transfer Presses • Multiple Plunger Presses • Hydraulic Presses, etc. • *MILL MACHINERY*—Rolling Mills • Wire Flattening Mills • Chain Draw Benches • also Slitters • Straighteners • Pointers Swagers • Cut-off Saws • Coilers • Winders, etc.

FOUNDED WATERBURY FARREL 1851

In Equipment, Experience Counts . . .

INDISPENSABLE!

The 1955 Edition of the WIRE and WIRE PRODUCTS BUYERS' GUIDE and YEAR BOOK Of the WIRE ASSOCIATION

Thousands of changes in the listings of machinery, equipment, supplies, rods, wire and wire products. The only directory of everything of interest to wire men, this book is an indispensable reference with which to locate sources of supply when you are in the market to buy something.

The Year Book section is completely new. Contains the current directors and officers of the Association, the history of Association activities in 1954, a list of members as of February 1st, the By-Laws of the Association and lists of Medal Award, Certificate of Honorable Mention, Mordica Memorial lecturers.

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Subscribers to WIRE AND WIRE PRODUCTS receive a discount of 40%. Members of THE WIRE ASSOCIATION receive a copy without additional cost.

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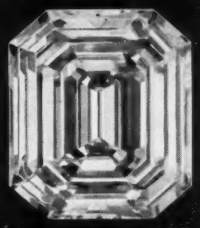
453 MAIN STREET • STAMFORD, CONN.

Here is perfection!

ROEBLING high carbon wire is unsurpassed for industry today. Roebling wire is absolutely true to specifications ...absolutely uniform in gauge and finish. Manufacturers who try Roebling wire once, become Roebling customers from then on.

You *pay* for the best when you buy high carbon wire. Make sure that you *get* it! Always specify Roebling. John A. Roebling's Sons Corporation, Trenton 2, N. J.



The Jonker, world's largest emerald-cut diamond.

ROEBLING CF&I

A subsidiary of The Colorado Fuel and Iron Corporation

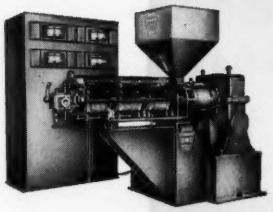
BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

Electrical Wire Insulating Machinery

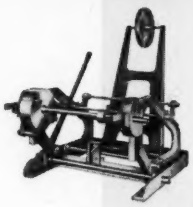
. . . a Complete Line

EXTRUDER · PAY-OFF · CAPSTAN · TAKE-UP

For coating wire with plastic — whether you need a single component or a complete installation — be sure to check with Davis-Standard.

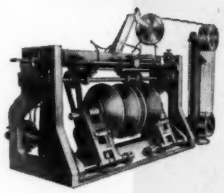


The heart of any installation — the **DAVIS-STANDARD EXTRUDER.** Sizes from 1½" to 6". Equipped with advanced-design Stream-Flo head and "Therma-Fin" heating jacket.



DAVIS-STANDARD PAY-OFFS for reels up to 48" diameter. Clean, simple design. Self-braking feature actuated by wire speed.

Offered in a wide variety of designs, the **DAVIS-STANDARD CAPSTANS** are available in standard drum sizes of 16", 24", 32", 48", and 60". Gear reducers are standard. Four-speed transmission is optional.



The improved **DAVIS-STANDARD TAKE-UP** offers smooth, automatic, high-speed production with a minimum of attention and effort from the operator. Takes reels up to 36" diameter. Speeds up to 1600 ft./min. U. S. Patent 2,653,773.

For continuous vulcanizing installations, Davis-Standard also supplies the complete line, including splice boxes, vulcanizing tubes, cooling troughs. Our engineering staff is ready to help you.

DAVIS-STANDARD SALES CORPORATION

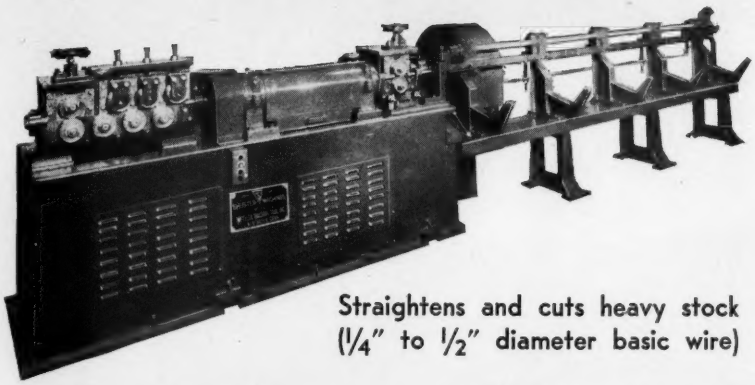
16 Water Street Mystic, Connecticut

Sole selling agents for

THE STANDARD MACHINERY COMPANY

World's Largest Manufacturers of Custom-Built Extruding Machines

MOVE INTO THE *Automation Age* *with the* NEW SHUSTER 3A!



Straightens and cuts heavy stock (1/4" to 1/2" diameter basic wire)

ELECTRICALLY CONTROLLED Clutch and Target Increase Efficiency and Production!

NOW get highest SHUSTER production plus electrically controlled Clutch and Target! Advanced SHUSTER designing improves efficiency of operation and minimizes waste. Send for complete details!

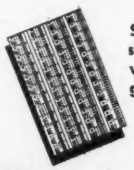
OUTSTANDING FEATURES:

- Instantaneous clutch and cut-off cam.
- Lightning cut-off knife for clean, true, square-cut ends.
- Ball and roller bearings throughout.
- V-Belt motor drive for quiet, efficient operation.
- Preliminary Straightener: The feed rolls and the lower breaking rolls are gear driven, and mounted on Timken Roller Bearings. The upper breaking rolls are not gear driven, but are mounted on anti-friction bearings. This device removes the natural curve of the coil and rough straightens the wire before it enters the rotary flier to be made perfectly straight.
- 5-Die Straightening Flier. Highspeed drive creates high production standards.

SHUSTERS are available for .025" to 11/16" diameter wire: shapes, flat stock, tubing.

Write us your requirements.

Representatives in all principal cities.



Send for free, wall-size, split-gauge wire chart, from 41 gauge to 7/0.

SHUSTER

METTLER MACHINE TOOL, INC.

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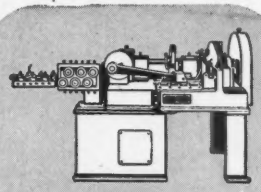
80 YEARS

SHUSTER

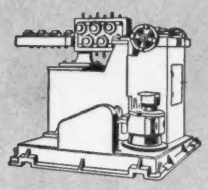
AMERICA'S OLDEST NAME IN WIRE STRAIGHTENING & CUTTING

80 YEARS



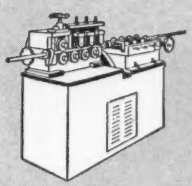
SLIDE FEED STRAIGHTENERS

3/8" x 10"; 9/16" x 10"



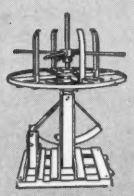
FEED STARTER AND STRAIGHTENER

Max. 5/8" dia.



TUBE AND BAR STRAIGHTENER

7/32" to 5/8" bar 1" tubing



REELS

400 lbs.

Gentlemen:

Please send us your recommendations. Our straightening and cut-off requirements are as follows:

.....

.....

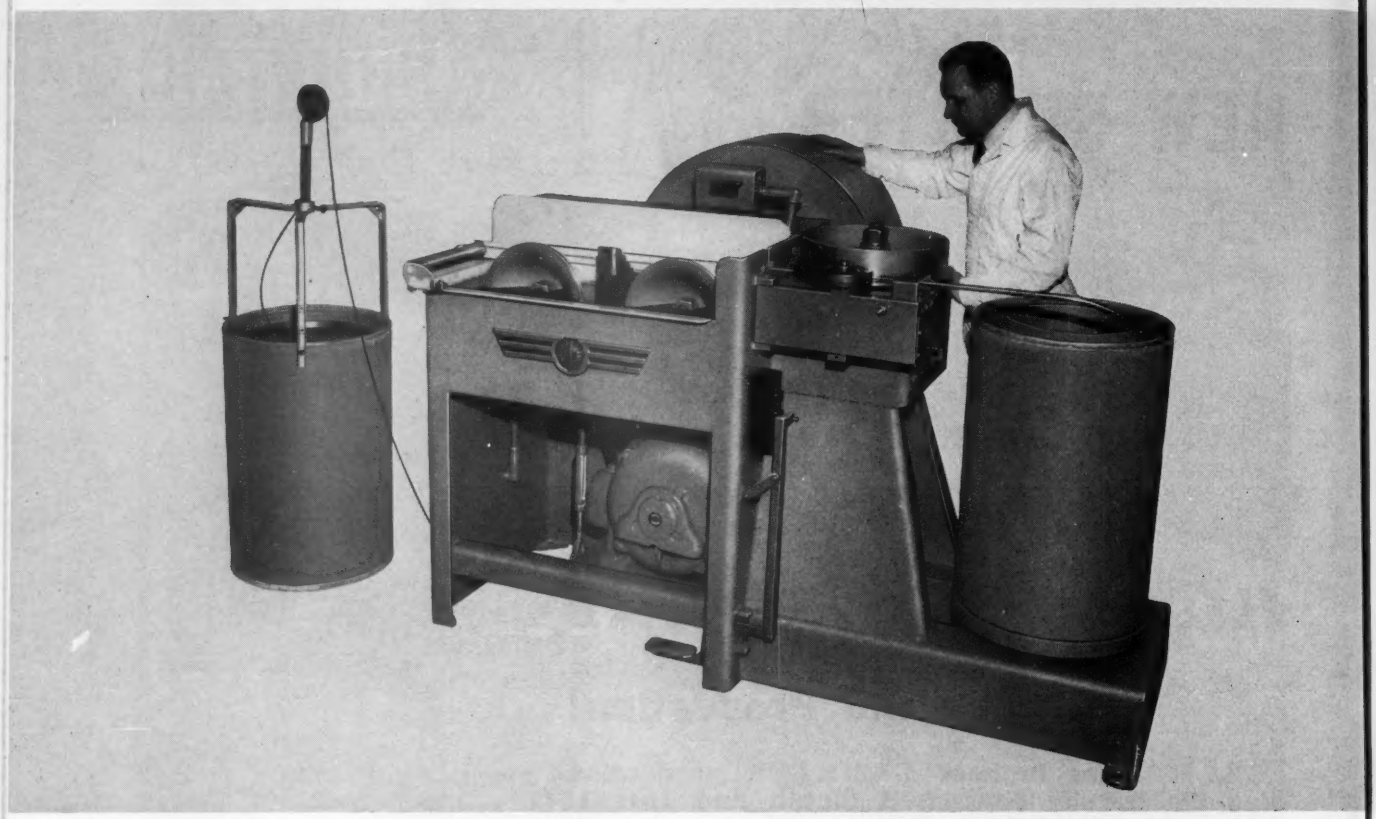
Name .....

Firm .....

Street .....

City ..... Zone ..... State .....

Coulter & McKenzie DRAW·PAK *Equipment*



Model 116—Continuous Fine Wire Drawing and Packaging Machine

Continuous Drawing & Packaging Machine Yields HIGHER EFFICIENCY in fine wires!

Sustained higher efficiency is being realized in fine wire production using banks of five or six Coulter & McKenzie Model 116 machines. Each machine will continuously draw and package a 500 to 750 pound wire at a rate up to 1500 feet per minute.

Both small and large wire mills are now producing continuous coils from 500 to 750 pounds with a minimum capital expenditure and they are attaining assured production approximating *automation*. Multiple shutdowns and handlings are thereby eliminated, and production volume is greatly increased. The **Draw-Pak** 116 is designed for low carbon steel wire starting at No. 13 gauge (.0915″) hard drawn, but is being supplied to meet a wide variety of customer requirements.

Devices for stationary drum and rotating drum payouts are available at low cost from Coulter & McKenzie to accommodate all fine and intermediate wire sizes in various container sizes. Handling facilities are also available for overhead drum lifting. Economical hand lift trucks or attachments for your conventional power trucks are offered nationally.

The wire processor will want this package because it saves him money; the wire mill must have this process to obtain higher efficiency through longer continuous runs and direct, ready for shipment packaging.

Prompt attention to your inquiry may be assured by specifying the wire to be processed and its ultimate application.

Patents Pending

Continental Can Company Licensee

771 WATER STREET
OPPOSITE RAILROAD STATION

TELEPHONE EDISON 5-1101
LIEBER'S CODE "MACKENZIE"

THE COULTER & McKENZIE MACHINE CO., INC.

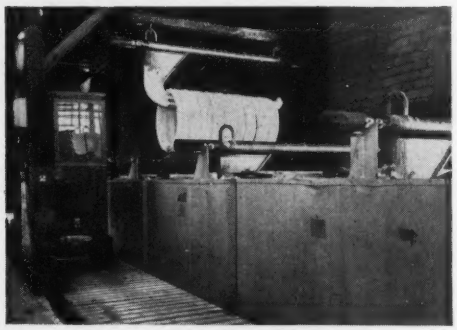
SINCE 1843 BRIDGEPORT 3, CONNECTICUT, U. S. A. INCORPORATED 1881

NO PICKLING PROBLEM Too Large or Too Small

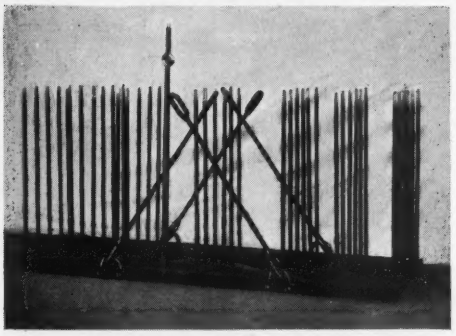
WELDCO Specialists Handle Them All!

IN HUNDREDS OF PLANTS, you'll find Weldco equipment all along the pickling line. For Weldco products are made of corrosion-resisting, hot rolled metals, that withstand attack from hot acids and other pickling solutions. They are strong yet light-weight, wear-resistant, durable, and long-lasting. You get all these advantages when you specify Weldco hooks, mechanical picklers, crates, baskets, racks, chain, steam jets, and accessories.

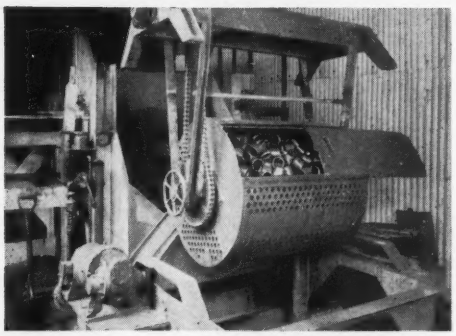
Weldco offers a complete, well-designed line of pickling equipment . . . plus the services of our experienced staff. Let Weldco engineers take care of all your pickling needs. For any problem, large or small, they have the practical, cost-cutting answer.



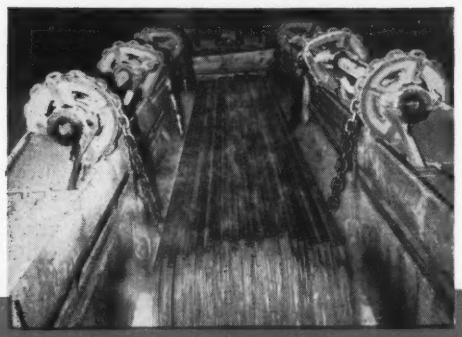
Weldco Pickling Hooks



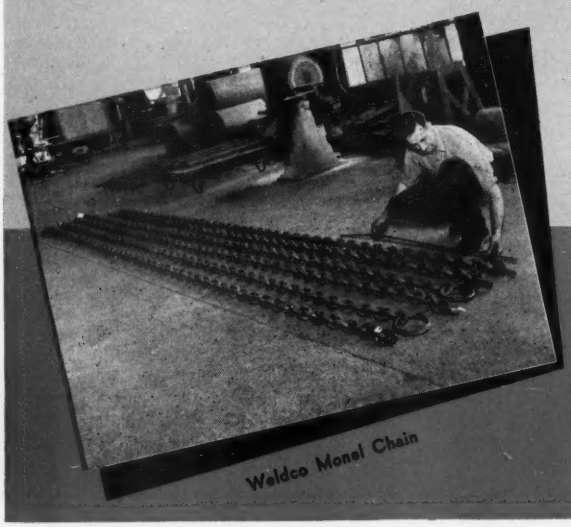
Weldco Sheet Pickling Crate



Weldco Mechanical Drum Pickler



Weldco Mechanical Bar and Tube Pickler



Weldco Monel Chain

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY

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Economical

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A DIAMOND COMPOUND WITH MORE DIAMOND FOR LESS MONEY!

AND - WE TELL YOU HOW MUCH DIAMOND YOU ARE GETTING!

Why should there be so much mystery about how much diamond there is in the diamond compound you buy? We WANT you to know exactly what you get when you use UNILAP-TC:

UNILAP-TC: THE HIGHSPEED DIAMOND ABRASIVE

GRADE NO.	COLOR	CARATS OF DIAMONDS PER GRAM	PRICE PER GRAM
1	Ivory	.50	$2.00
3	Yellow	.90	3.25
6	Orange	1.15	3.75
8	Green	1.20	4.00
15	Blue	1.25	4.05
30	Red	1.75	5.70
45	Brown	1.75	5.70
230-325	Purple	1.50	4.85
170-230	Gray-Black	1.50	4.85

Supplied in 5 gram cartridges, 5 gram jars, 7 gram tubes and 18 gram cartridges.

UNILAP-TC is sold on a money-back guarantee. If you are not satisfied that UNILAP-TC provides more efficiency and economy than any other compound you have used, just return the unused portion for full credit.

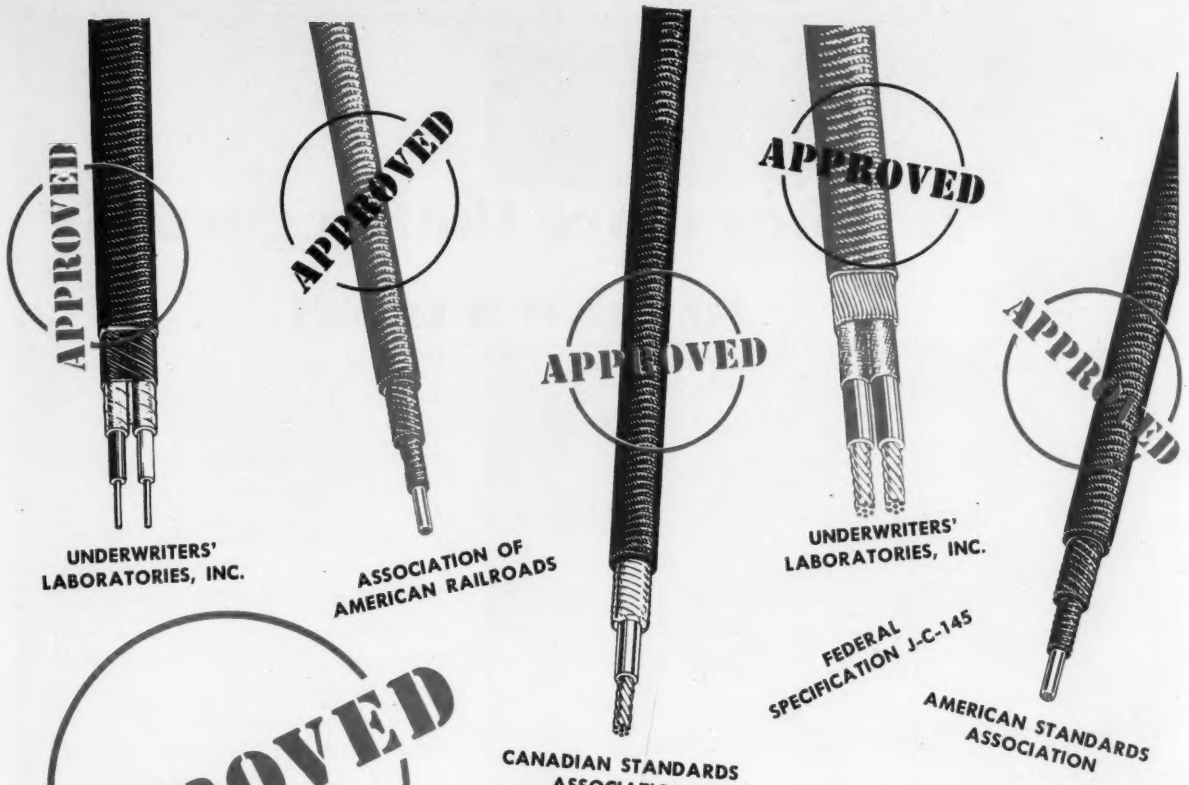
For efficiency, for economy, try UNILAP-TC and compare!

Buying diamond compounds merely on the basis of "they work" is costing you a lot of money. No pig-in-a-poke is the UNILAP-TC compound — you know what you are buying and you are buying

The Best for Less

UNION WIRE DIE CORP.

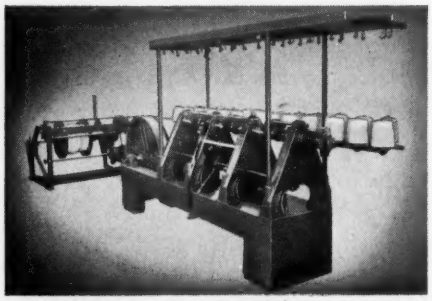
MAIN PLANT 375 FAIRFIELD AVE., STAMFORD, CONN. - 71 WEST 45th. STREET, NEW YORK 19, N. Y.



WIRE AND CABLE COVERING—AT HIGH SPEED

...WITH THE FIDELITY SINFRA KNITTER

WEATHERPROOF WIRE • BUILDING WIRE • NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • OTHER GOVERNMENT & INDUSTRIAL WIRES



Sinfra Machines are available for covering wire sizes up to and including 500,000 C/M.

Your wire and cable can carry all the important stamps of approval—when you use Fidelity Sinfra Knitters in your covering operations. Wire and cable produced with these high speed wire covering machines meet the highest standards of recognized testing bodies . . . carry their authorized approval for industrial and military application.

Leading manufacturers agree, too, that the Sinfra Knit process has proven superior to conventional braiding methods of wire and cable covering. A Fidelity Sinfra Knitter covers up to 2500 feet of wire or cable per hour. Automatic electric stop motions and accurate product control permit the production of a better product at lower cost.

Many additional advantages of this amazing machine are described in Catalog W. Write for your copy today . . . or see the Fidelity Sinfra Knitter in the new show rooms at our plant.

Designers and Builders of Intricate, Automatic Precision Machines

SINCE 1911

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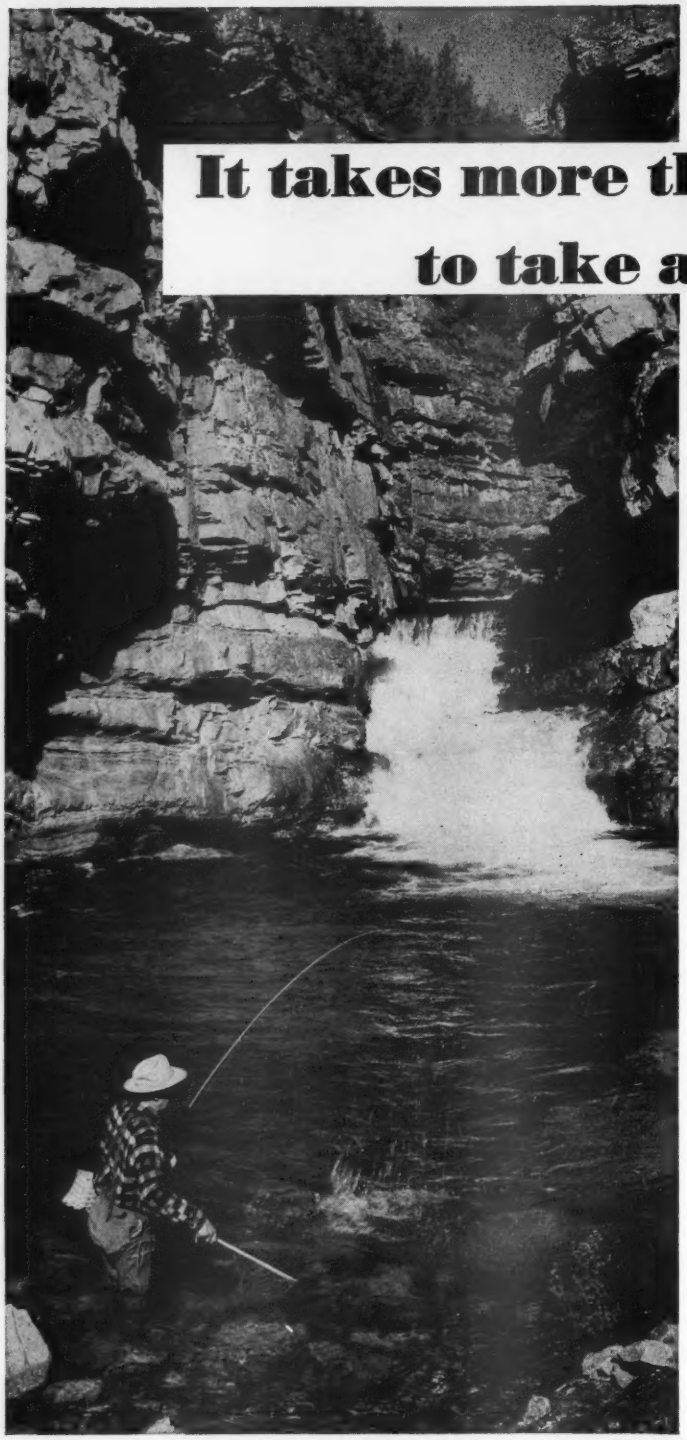


It takes more than a good fly to take a trout

Even the costliest fishing gear, the finest rod, the best reel and the prettiest fly can't assure catching a wily trout. It's the experience behind these accessories, that fills the creel.

There's no substitute for "Know-How" and that's particularly true in adapting metal treating chemicals to established production. It can't be gotten out of books, through black magic or out of a crystal ball. Only years of active contact, with actual manufacturing procedures, can be depended upon for satisfactory solutions of the metal protecting problems constantly confronting manufacturers.

ACP offers ideal products for removing and preventing rust on metal, chemicals to bond paint to steel, zinc, and aluminum, and pickling acid inhibitors. In addition, ACP furnishes a free service of an organization of technical experts with over 40 years' experience in solving metal preservation problems for the largest as well as the smallest operation.

Rely on service backed by experience. You are obligated in no way by consulting our technical staff.

Write or call for further information on ACP chemicals for metal protection.

Since 1914, Pioneering Research and Development in Metal Protection

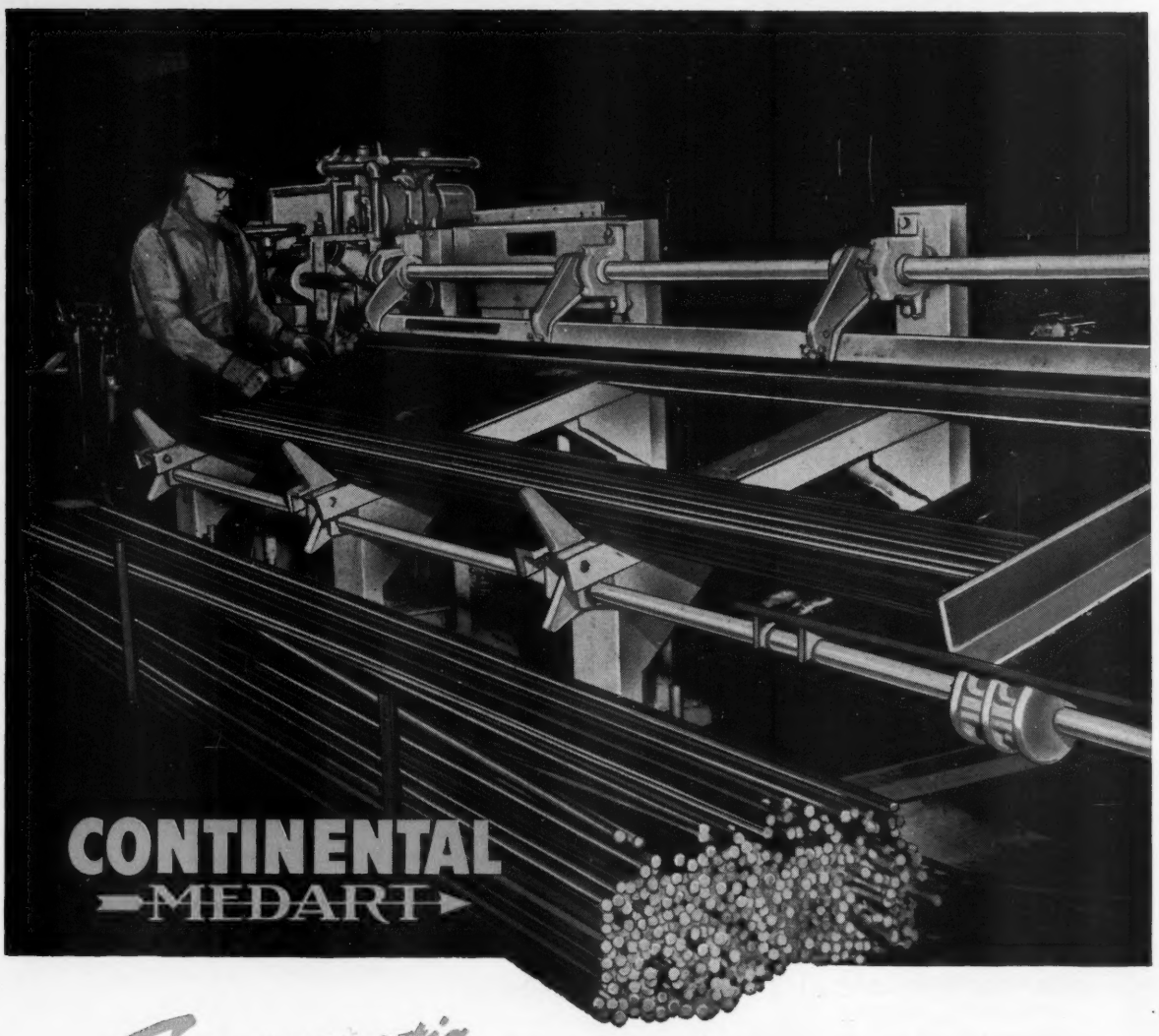
CHEMICALS ACP PROCESSES

AMERICAN CHEMICAL PAINT COMPANY

CHEMICALS ACP PROCESSES

AMBLER, PENNA.

DETROIT, MICH. NILES, CALIF. WINDSOR, ONT.



Supermatic
SHAPE STRAIGHTENER AND CUT-OFF

Now! High speed, precision straightening of any wire shape—flats, squares, rectangles, oval, hexagon or special—on the Continental-Medart Supermatic Two-Plane Straightener and Cut-Off. Operation is fully automatic, push button controlled and production is approximately twice that to be expected of conventional straighteners.

Length gauge is electronically actuated and shearing is accomplished without pause. Four machine ranges offer straightening over the complete range from 1/16" to 1" sections regardless of shape. If your operations involve precision shapes, investigate the Continental-Medart *Supermatic* Two-Plane Straightener and Cut-Off.

Write **for descriptive bulletin 52AA or tell us your problem.**

CONTINENTAL BUILDING, 220 Grant Street, Pittsburgh 19, Pa.

Plants at
East Chicago, Ind. • Wheeling, W. Va. • Pittsburgh, Pa.
***Copes-Vulcan Division*, Erie, Pa.**

CONTINENTAL
Foundry & Machine
Company

A Fine Meeting to Attend . . .

THE WEST COAST REGIONAL MEETING

of

THE WIRE ASSOCIATION

JUNE 10, 1955 • SAN FRANCISCO, CAL. • THE PALACE HOTEL

THE PROGRAM

9:00-10:00 A.M.— Registration at The Palace Hotel.

10:00-12:00 A.M.— Forum: Open Forum Meeting of mill men and wire consumers to discuss mutual problems.

12:30- 1:30 P.M. — Buffet luncheon at the plant of The E. H. Edwards Company, Butler Road and Industrial Way, South San Francisco, through the courtesy of E. H. Edwards, President.

2:00- 4:00 P.M. — Tour of the plant of the E. H. Edwards Company, manufacturers of Edwards Wire and Edwards Wire Rope.

6:00- 7:00 P.M. — Cocktail Party at The Palace Hotel.

7:00 P.M. — Dinner, Speaker, Movie and Door Prizes. The motion picture will be supplied by and shown through the courtesy of the Bethlehem Steel Company.

NOTE: YOUR ATTENTION IS PARTICULARLY CALLED TO THE FACT THAT MEETING WILL BE HELD AT THE PALACE HOTEL, INSTEAD OF THE SIR FRANCIS DRAKE, AS PREVIOUSLY ANNOUNCED.

MAKE YOUR RESERVATIONS EARLY !!!!

If out-of-town guests need transportation from the down-town area please advise at the time you make your attendance reservation.

SEND YOUR RESERVATIONS TO WILLIAM MOHR, CARE OF THE COLORADO FUEL & IRON CORP., 30 TANFORAN AVE., SOUTH SAN FRANCISCO, CALIFORNIA.

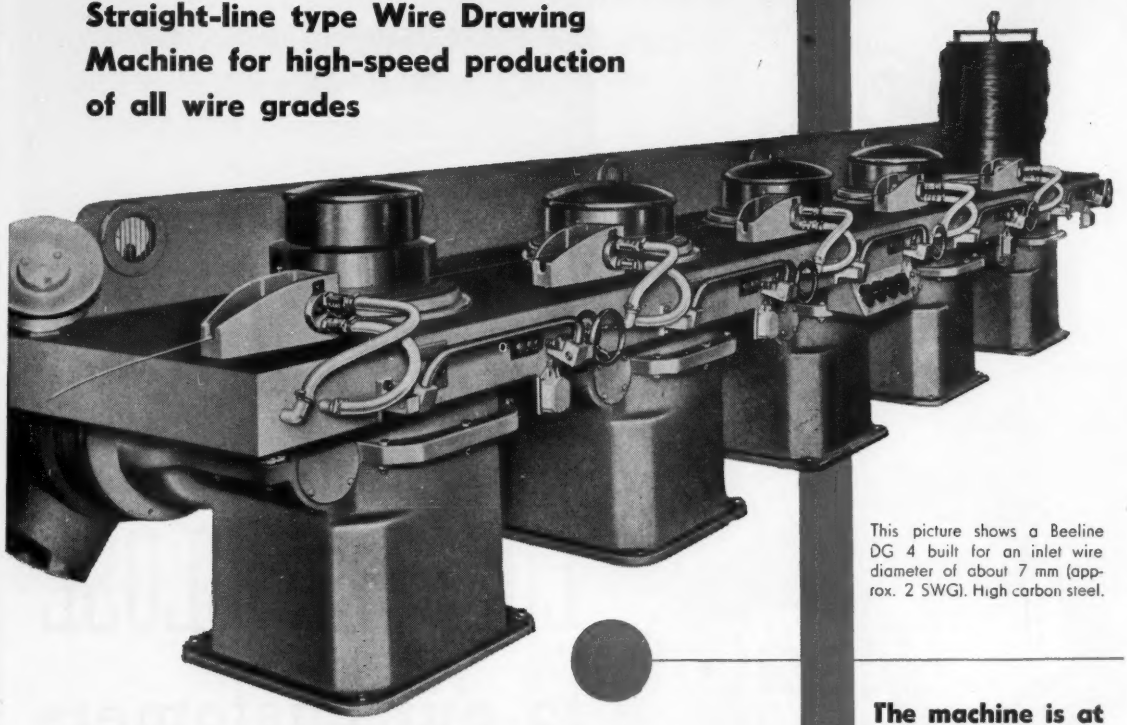
THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

453 MAIN STREET **STAMFORD, CONN.**

THE BEELINE WIRE DRAWING MACHINE

Straight-line type Wire Drawing Machine for high-speed production of all wire grades



This picture shows a Beeline DG 4 built for an inlet wire diameter of about 7 mm (approx. 2 SWG). High carbon steel.

Prominent Beeline features:

- Complete absence of slipping between wire and block.
- Direct block-to-block wire running, with automatic speed control and no loops or other mechanical adjusting devices.
- Continuous speed adjustment from almost zero up to maximum.

Let us help you solve your problems. We shall be glad to answer your questions promptly. Don't forget to let us know what wire is to be drawn, the inlet and finished diameter, its intended use, the production required, and all other relevant information (tensile strength of the finished wire etc.). Then we can suggest a machine that is just right for you.

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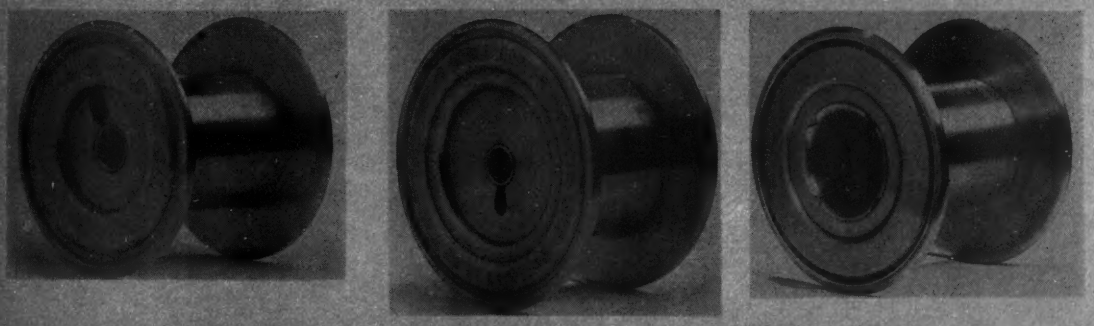

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The Wire Outlook

Business has improved to so much higher levels than predicted that economists are now divided in opinion as to whether it is advancing too fast or not fast enough.

The fact is that 1955 gives promise of being one of the most active years in our history and may equal or even top the levels of the record-breaking 1953 year. Steel, auto, construction and retail sales are all booming at higher rates than thought possible, although there are spots in our economy that are weak. This is normal, for all industries do not move ahead in exact unison.

Businessmen, broadly speaking, feel confident that the outlook is good and the basis of the country's economy is sound. It is expected that the high rates of steel production and levels of retail trade will be maintained throughout the year. Of the 2,125,000 cars produced in the first quarter, it is encouraging to note that 1,800,000 were delivered to customers, so that dealers' stocks are not excessive.

A danger spot in the economy is the large expansion in consumer indebtedness, now totaling 30 billions. This is worrying Washington and giving rise to renewed consideration of stiffening credit rates. Possibly even more serious is the sharp rise in home mortgages, which aggregate nearly 76 billion dollars. Some loaning institutions feel that 30 year mortgages are an invitation to "boom and bust" conditions. Also, farm income dropped over a billion dollars in 1954. However, 1.5 million more people are working now than in the peak year of 1953.

Inventory building is now beginning in earnest. As last year inventories dropped to too low a volume, some of the buying now is to get stocks back to normal to provide protection against rising prices. Copper users are suffering somewhat from the pinch of keeping their inventories low when supply was adequate in 1954. When strikes curtailed production, the demand for it sent prices soaring to 36 cents per pound. The Government is now making 17,500 more tons of copper available during the second quarter, but even this is insufficient to take care of the growing demand.

Orders for wire rods and manufacturers' wire has grown substantially—the best since 1953. Welded wire fabric is moving in substantial tonnages. Merchant wire product orders, while showing seasonal improvement, are not as high as expected at this season. Spring wire demand is strong. High carbon specialty wire is moving well, but rope and fine wire sales are lagging. Demand for highway guard cables is good. Upholstery wire demand is excellent and fastener wire sales are good.

The increasing uses of aluminum, in spite of constantly higher levels of production, are now giving rise to consideration of further expansion. The supply of nickel for non-defense production has been reduced because of heavier defense production orders.

It is now safe to say that we have passed through the recovery cycle and now are in a mild boom period. The outlook is good for the entire year and some forecasters are going so far as to say that present levels of activity will carry over into 1956. There will be some price advances, resulting from higher wages, but in the main prices will remain fairly steady.

Looking further into the future, the recent Joint Committee on the Economic Report states that by 1965 our gross national production will have increased from its high of $365 billion in 1953 to $535 billion, with increases in civilian employment from 63.5 million to 79 million, and in industrial employment from 49.3 million to 60 million. The report also predicts increased annual expenditures for plants and equipment to go from $36 billion to $60 billion.

Population experts have pointed out that our population may total 200,000,000 in 20 years. This does not mean more prosperity per se. Huge populations have not brought prosperity to Eastern nations. The answer is ever increasing production to keep pace with our population growth. A measure such as the guaranteed annual wage would be more than likely to reduce our productivity in the long run. Let us hope that it isn't forced on industry.

—from the Editor's Desk

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Vol. 30 May, 1955 No. 5

The Role of Wire and Cable in Military Communications

by Howard L. Kitts and Howard F. X. Kingsley
Coles Signal Laboratories
Signal Corps Engineering Laboratories
Fort Monmouth, New Jersey

This paper was delivered at the 1954 Wire and Cable Symposium at Asbury Park, N. J. on December 9, 1954. Mr. Kitts, who presented the paper, is Chief, Outside Plant Equipment Section, Wire Communication Branch, Coles Signal Laboratory.

Today's newspapers and magazines constantly bring to our attention headlines such as "Modern Warfare, the new look of the Army, atomic cannon, guided missiles and aircraft warning networks". Reference is made to possible conflict in widely scattered places around the globe, to the great speed of action and the many separated echelons that will be involved. Without the present day capability of military communications, it is highly doubtful if these projected actions could occur.

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The term "military communications" will be defined for this discussion as the transmission of intelligence between any two points. It may be via wire or radio or a circuit using both types of transmission. It may be a circuit that permits two people to talk to each other or the more difficult types of transmission for printing teletype, facsimile, data transmission and wide band video circuits. Multichannel equipment is widely used to provide greater traffic capacity over the single transmission medium.

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The planning of any military action today is dependent upon the degree that communications are to be available. One undisputed rule of warfare is that regardless of the thoroughness of the planning, no mission ever goes exactly according to plan. The weather and the action of the enemy can greatly change the course of any set of plans. To meet the changing situation, the effectiveness of a commander is dependent upon (a) his receiving timely, accurate and adequate intelligence and (b) his ability to have his commands delivered to the right place at the right time.

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Fortunately, our country has developed a commercial system for the transmission of intelligence that can be considered superior to any in the world. The personnel, research, development and production facilities which have made this possible are also the foundation upon which it has been possible to build the wonderful military communication system we have today.

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So many times the question has been asked, "With all this, why do we need the military research and development laboratories and personnel on the government payroll, why does the military need equipment different from that already available in the commercial world?" A little conversation and the questioner usually begins to answer his own question.

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Let us review some of the basic factors in military communications. Warfare of today is global which involves long distances over land and water, extremes of environment such as heat, cold, wet and dry, sand, snow, ice and tropical fungus.

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The action of warfare has progressed to unbelievable speeds as represented by the modern bomber or the fast-moving armored unit on the ground.

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New types of weapons indicate

the need for greater dispersal of forces which in turn places a need for more communications. The increased destructive area of the new weapons dictates greater need of alternate routes and flexibility of the system so that the destruction of any one location cannot cripple the entire system.

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A completely integrated system of wire and radio facilities is a "must" and extensive use of radio relay in the system is envisioned, but wire communication is still the backbone and the workhorse of the system. There are very definite limitations on the number of usable radio channels in any given area—but not to the amount of wire and cable that may be installed. Radio traffic can be intercepted by the enemy and transmitting sites very definitely located. The requirements for wire transmission facilities—both local and long-haul types is increasing—not diminishing.

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Today is a far cry from the days less than 100 years ago when the Signal Corps was established as a branch of the Army on 3 March 1863. Later in that year the United States Military Telegraph Department, a civilian organization, was given operating control of all field telegraph lines. In 1867 **Colonel Meyer** regained control of military telegraphy. It is of interest that the Signal Corps, less than two years after the invention of the telephone, constructed a 40-mile telephone line at Fort Whipple, Virginia, for test purposes.

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Through the succeeding years, military signal communications slowly advanced and in the late 30's, the tempo of development was increased. It was during this time that words such as "Radar", "Walkie-Talkie" and "Handy-Talkie" appeared. World War II saw a great change in military communications. Carrier telephone and telegraph, radio relay and large long-distance networks came into use. A majority of the equipment was modified commercial types. It worked—after a fashion—but did not fulfill all of the military requirements.

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Many of you have heard the reference to the "Post War Planning Program". The experiences of World War II were analyzed and specific requirements established for practically every single item of signal equipment. The development-research program of the past eight years resulted—a program in which industry played a big role—first by providing personnel with background knowledge and facilities to conduct the research and development by contract with the government and second, after approval of the items, the quantity production of the new equipment.

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Before discussing specific items, the basic requirements which in most cases are the difference between commercial and military, can be established. These requirements are not necessarily restricted only to wire and cable. The minimum types of equipment shall be used. This means a saving in storage and issue, less chance the needed equipment will not be available in the field, less training problems, less maintenance and repair problems. It may be true in trying to make a single design do the work of several, it will not do one particular job as well as a specialized design in which case the facts must be carefully weighed to determine whether one or two designs will be used.

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Field wires and cables must be rugged and capable of aerial construction, laid on the ground, buried in the earth or even underwater where rivers, small lakes, etc. are encountered. To achieve this ruggedness, however, must not be at the expense of excessive increase in size and weight which become reflected in shipping and storage space and difficulty of handling by troops.

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The transmission facilities must meet stringent electrical requirements—equal to those in the commercial field for the same frequency band. Installation time however is measured in a few days, many times in hours. The careful advance planning, trained and experienced supervisors and well-trained construction crews who, except in emergency repairs, do not work under conditions approaching the stress of the combat theater, are factors not usually found in military construction to be the equal to the commercial field. Yet the quality of the finished line must be of the highest. Specialized military design is the answer.

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In commercial life, the local phone company plans an expansion of the plant. The most economical designs are procured for the particular job. Right in this area along the shore, there is a distinction between many outside plant items in respect to finish and material based on the distance of the pole line from the shore line. Material is ordered and delivery scheduled for a specific time to match the construction program. Now consider the military problem. When will the material be required? How many miles of pole line will be needed? Where will it be installed? Your guess is as good as any. But you will agree that we should be prepared to build the needed pole line any time, anywhere in the world, for it may be the means of saving many American lives.

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Let us now consider some of the specific fields of wire and cable, review what has been accomplished, compare the accomplishment with the requirements and determine what must be done in the future.

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Field wire is used by every echelon, even by the individual soldier crawling on his stomach forward of his lines on reconnaissance. In World War II there was lightweight Assault Wire W-130 type, Field Wire W-110B and Long Range Field Wire W-143. Today there is one standard called Wire WD1/TT, light as the old assault wire and the talking range of the old heavy field wires—a better wire both from a military usage

and a production viewpoint. But it is not the final answer.

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When used at low temperatures it stiffens and cannot be handled as desired. When exposed to the weather, it has a limited life. Its transmission characteristics vary greatly from a dry to wet condition. The abrasion resistant jacket is restricted to a single specific material compound.

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A paper was presented on the recent research at **Battelle Memorial Institute** which endeavored to find the cause of deterioration from weather and to devise a rapid means of artificial aging so that different materials can be quickly evaluated or control maintained on any selected material. A final solution has not been obtained. A lot of work still remains to be done. The problem is being attacked from another angle, namely, improve the material or find another material that will answer the requirements. It is not necessary to achieve the commercial concept of 20 or more years of life but a one year life is too short.

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When increased talking distance is desired, what is more logical than the use of a repeater? But this change from wet to dry gives the repeater design engineer grey hairs. The twisted pair field wire can be stabilized or become a cable design but can we afford the cost, increased weight, etc.? Development is now in progress on this problem of stabilization of a twisted pair.

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During the development of Wire WD1/TT, a very thorough investigation has been made of known available materials for either insulation or the abrasion resistant jacket. At this date, it is a research problem to give us new materials that will allow major improvement in electrical and physical characteristics. Don't offer suggestions of new materials too quickly. Some are known that apparently have very desirable characteristics—but—can they be extruded and at the speeds necessary for the production of the large number of miles of wire per month that the military will need in time of conflict. Is the material available in sufficient quantity and reasonably priced?

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Would the **Signal Corps Engineering Laboratories** be interested in a single material that would be insulator and abrasion resistant jacket combined? Most certainly—but not at the expense of any degradation of any characteristic of the present wire.

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There exists a field requirement for wire circuits that is very difficult to meet. Many installations in the supply system, attached service units, hospitals, etc., must have access to the long distance circuits, do not have sufficient volume of traffic to warrant a carrier telephone or carrier telegraph system but at the same time are physically located at a distance from the nearest long distance switching central that is beyond the transmission range of the field wire WD1/TT. A military standard has been established limiting to 9DB net loss any local loop circuit that will be switched to the long distance network. Using Wire WD1/TT, this means about 3 miles. It is estimated that a distance of 15 to 18 miles is actually needed. The mileage of such circuits is great and while the spiral four cable construction will provide two adequate voice frequency circuits, the military cannot afford the cost, the weight, the construction time. Furthermore, is it logical to use a facility designed to transmit 12 voice channels for just two channels? A lot of excellent engineers are trying to find the answer to this problem. Continuous loading, lumped loading, vacuum tube repeaters, transistor repeaters, battery power, power over the circuit, twisted pair, cable, attached connectors or field splicing—eventually the parts will fall into their proper place and the military will have a required piece of equipment.

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World War II introduced carrier frequency telephone and telegraph into the military system. Traffic volume and long distance network requirements made its use a necessity. Today's requirements have created the need to expand even more. The widely known spiral four system—cable and the CF type equipment—was evolved in World War II. This system provided three carrier channels and one voice frequency channel. The present military version provides either a four or a twelve channel system of higher quality than the original system plus an order wire circuit for the exclusive use of the operating personnel. An outstanding development was accomplished and it is particularly interesting that the new superior cable assembly costs less in actual dollars in today's market than did the original spiral four cable during World War II.

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This is a good place to divert for a moment and discuss cable connectors. A connector that is universal — all connectors are exactly alike but any two can mate together—is required. A small, lightweight unit that can be assembled onto the cable by the cable manufacturers—who are normally not in this field of production is needed. It must be easily connected in the field without any tools, maintain the high grade electrical characteristics of the cable, be waterproof whether from rain, high humidity or a 100 feet of water in a lake. The connector on the World War II spiral four cable or the 5 pair cable did not meet these requirements. But several years of development effort has resulted in a basic design. Applied to the new S/4 cable, it is sufficiently improved to permit the use of a separate loading coil and as a result, doubling the number of connections made per mile, yet with less danger to moisture penetration than in the old design. A connector only 4 inches in diameter has been designed with 52 contacts on the face for use with a proposed 26 pair cable assembly. In this large connector, metal added too much weight. However,

the search for a suitable plastic turned out to be a major problem. Tests have not been completed at the time this paper was written and a positive statement cannot be made that the new material is completely acceptable.

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The ultimate, however, was not reached in the spiral four cable design. The wire braid of this cable provides the necessary strength to make the cable self-supporting for aerial construction. Naturally, consideration must be given the effect this metal braid has in respect to the electrical characteristics of the cable. A type 302 stainless steel wire was found to be the most desirable—but this wire used 8% nickel—a critical material. At this very time—the final stage of a research program is in progress—namely, the production of a commercial size lot of a new alloy wire by two of the principal wire companies—a wire that uses no nickel and a minimum of any critical or strategic material and is equal to the stainless steel type 302 for use as the braid.

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In the rear stabilized areas, considerable use is made of commercial type lead covered cable and to date the military has not adopted the plastic cable as a substitute. During the past few years, great strides have been accomplished in this field for commercial use and today the **Signal Corps Engineering Laboratories** are conducting a comprehensive study of the plastic cable to determine whether a change of policy is warranted. Many factors must be taken into consideration beyond the specific technical characteristics of the cable. Equipment placed in depot stock may not be used immediately—in fact may not be used for several years. New field manuals are required, training courses established for field and school, standardization of techniques, etc., regardless of the supplier, splicing equipment stocked and issued and a firm policy determined relative to future planning—shall both types of cable be used or shall the trend be to final usage of only plastic type. Introduction of an item into the military communication system involves more than the mere purchase of the article.

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Coaxial cable for wide band transmission capable of handling several hundred voice channels or a video circuit is well known in the commercial field. Application to military service is in the exploratory stage. The **Signal Corps Engineering Laboratories** in conjunction with one of the well known cable companies, have been working on this problem for several years. Needless to say, the design of a flexible lightweight cable with universal connectors that will have the transmission characteristics of the commercial type is a major endeavor. The work has resulted in development of a three-layer wire braid shield that is effective up to 4 megacycles. A universal connector has been designed and a few models made for test that appear reasonable from a production standpoint and do not disturb the cable characteristics beyond allowable tolerances. At this time, the greatest question is determination of the frequency band required because this must be settled on a system-equipment use basis more than on the cable design.

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Do switchboard cords, telephone hand set cords and small interconnecting cords for equipments have anything in common? The attachment of terminations and flex life are a basic and common problem. The failure of a field telephone hand set cord or the switchboard operator's cord could be tragic under certain conditions of battle. Replacement is not as simple as calling the local repairman so the ultimate in life is desired. The problem is of sufficient magnitude to warrant an intensive program of investigation now in process to determine the factors entering into the design and manufacture of multi-conductor flexible cords and cord assemblies which affect their useful life.

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Has the old open wire pole line disappeared from the military picture? The old type multiple crossarm construction, the pairs for voice frequency or the "H" or "C" type carrier telephone systems will probably find little future usage. Development however has resulted in a four pair line and sectional metal poles. Each of the two pairs on the top arm is suitable for 160KC transmission and each of the two pairs on a lower arm may be used up to 40KC. The pole will support in addition two spiral four cables. Hence, with suitable terminal and repeater equipment the top pairs can each provide 16 channels, the lower pairs each provide 4 channels and each spiral four cable 12 channels, a total for the pole line of 64 channels. A sectional metal pole for this line has been developed. By nesting the sections, a package 7 inches in diameter and 7¼ feet long is obtained for storage and transportation. Accessories such as cable hangers, bolts, nuts, clamps, etc., for attachment of crossarms, guys and spiral four cable are contained within the package. Two designs were evolved, one using aluminum resulted in a weight per pole of 77 pounds, a second design using steel resulted in a weight per pole of 113 pounds. This type of pole does not replace the conventional wooden pole, the cost per pole is several times that of a wood pole and the load carrying capacity is less than a conventional class 7 wood pole of the same length. This pole has the advantage of minimum bulk, weight, can be stock piled and stored for indefinite periods and is easily transportable by any means including air. A wooden pole has one disadvantage—it cannot be cut up into short sections, put back together again and have its original strength. Present policy also does not permit the stock piling of wood telephone poles.

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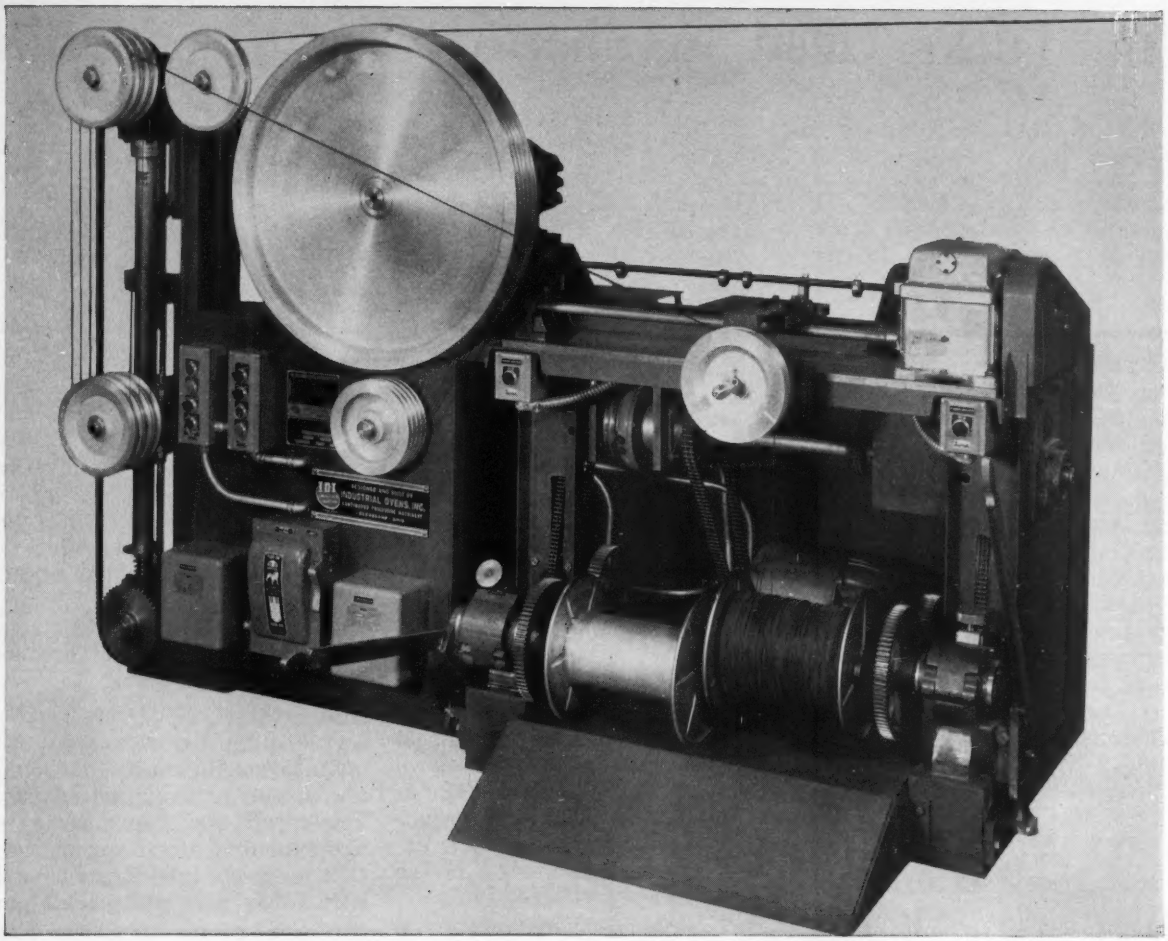
Military pipe lines with the pumping stations not more than 10 miles apart and military railway systems with the way stations at about the same distance

(*Please turn to page* 596)



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The Turks Head in Shaped Wire Production

by Lawrence J. Sarkozy
Chief Field Engineer
The Fenn Manufacturing Co.
Newington, Connecticut

Part II

Part 1 of this article, which appeared in April, treated of the origin of the Turks Head, its applications and principles of operation, describing the various types available.

In Part II, the author covers the application of the Turks Head to industrial fabrication in considerably greater detail, outlining the usual faults resulting from misapplication and the steps to take to remedy them.

In part II it was noted that the Turks Head was slow in gaining acceptance in the modern wire plant, because of the demand for higher and higher production speeds, and for closer tolerances than were possible in those earlier stages of development. In recent years their use has gained rapidly as design improvements made higher production speeds and close tolerances possible. To obtain these speeds and hold tolerances within acceptable limits two general conditions must be fulfilled:

1. **The Turks Head must be properly applied.**
2. **Certain fundamental operating rules must be followed.**

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Proper application of Turks Head equipment cannot be overemphasized. A Turks Head is not, nor is it intended to be, a replacement for a rolling mill, although certain basic rules apply to both machines. For example:

A. Size Control. An important feature of size control is what in a rolling mill operation would be called spreading. In Turks Head operation we of course encounter both horizontal and vertical spreading but the cause, friction between the rolls and the material, occurs in the same manner and is subject to the same general rule—the greater the friction the greater the spreading. As friction increases with heat, thereby increasing spreading, cooling and lubricating fluids serve to cool the wire and maintain size in the finished product, as well as helping to prevent formation of fins. Lubricating mineral oils lubricate the rolling surface and thus control friction heat generation; they also lubricate thrust washers and carry away a portion of the heat generated in the rolling process. In two-pass operation through one Turks Head, or single-pass operation through two Turks Heads in tandem, the large reduction should be taken in the first or breakdown pass, and the light reduction in the second or finish pass, to reduce the effect of heat generation unduly affecting size control in the finishing pass.

★ ★ ★

B. Surface Finish. While it has long been established that roll finish is the important feature in determining stock finish, tests give definite indication that a Turks Head operation improves the surface finish, and improves the quality of the metal because the grain structure is improved. Irregularities in the surface of the entering stock cause no particular difficulties; however, the better the entering stock the better the finished product. Bad surface defects obviously cannot be completely eliminated and of course lime coating, oxides and scale will in addition cause more rapid roll wear.

★ ★ ★

C. Accessories. Just as proper accessories are important to successful rolling mill operation so are they to successful Turks Head operation. In practically all Turks Head installations, it has been found necessary to provide entry stock guides to prevent jamming in the rolls. In addition, a back tension device, or a straightener, is often needed in front of the wire guide to eliminate kinks, and to guide the wire straight into the stock guide and rolls. Use of such equipment adds more friction, which must be taken into account to avoid exceeding the breaking point of the exit stock.

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D. In combinations. In attempting to obtain maximum effectiveness from the Turks Head, an understanding of the various ways that it may be used in combination with other wire plant machinery is of the utmost importance. Some of these combinations will be described.

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Turks Heads and Rolling Mills

Figure 6 shows a typical Turks Head and rolling mill combination, with a bull block. In this arrangement, the Turks Head may be used solely as an edger, or it may perform its normal function as a "full partner." Since flattening an inlet wire in a rolling mill operation results in variations in stock width the Turks Head, when used in combination with a rolling mill, may serve a double purpose. Not only can it serve to control width as would an edger but a sizeable vertical reduction is permissible, if desired. Where further vertical reduction is not desired the Turks Head may serve the added function, not possible with an edger, of using the upper and lower rolls to prevent buckling or wrinkling. Or the rolls can be set for very

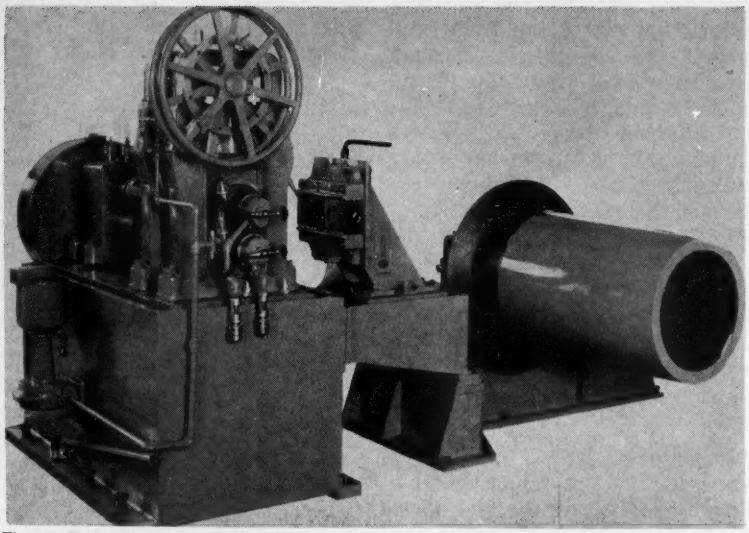

Fig. 6. Turks Head and Rolling Mill Combination.

slight reduction, .0001" or .0002"; this insures uniform thickness to close tolerance.

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When the Turks Head is used as a full partner, the mill performs the function typical of a rolling mill operation, but the rolled product is left with oversize dimensions, vertically and horizontally. The Turks Head then completes the vertical reduction and at the same time accomplishes the horizontal reduction, insuring uniform width. As has been pointed out, the reductions expected in a rolling mill operation must be performed in a rolling mill. The combination of rolling mills and Turks Heads unites the desired features of each in single pass operation. In addition, this combination is especially useful in drawing special shapes, where the mill rough-shapes the round stock and the Turks Head finishes the shaping. Here, one-pass operation to accurate dimensions and desired finish contrasts sharply with the many passes through the several draw dies previously required.

Turks Heads and Draw Bench

This is a very useful combination where short lengths are to be produced, and coiling is impracticable. Later in this article is shown a typical Turks Head and draw bench operation, in which 2½" hot rolled tubing is roll shaped to a round-cornered 2" square. Utilization of a Turks Head in place of draw dies will usually result in fewer passes and substantial tool replacement savings, as well as increasing the flexibility of the combination.

Turks Heads as Wire Shaping Mills

Figure 7 shows our Wire Shaping Mill, which includes two Turks Heads in tandem and motor driven reel, all mounted on a rigid base. In most instances this is an economical purchase, because it combines two material handling passes in one, its rigid mounting eliminates alignment problems, and because of its integrally-built stock cooling and lubricating system.

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Sharpness of corners is more easily obtained in this tandem arrangement by taking about 75% of the total reduction in the first Turks Head and 25% in the second, for the reasons pointed out under "size control." The tensile strength and yield strength of the stock must of course be taken into account, as well as other applicable operating rules.

Basic Operating Rules

The second reason for increased use is the formulation of certain basic operating rules. Previous lack of understanding had led to their violation and to unsatisfactory results. These are covered briefly in the following five sections.

Bearing Capacities vs. Speeds

This subject is of great importance to the Turks Head owner. We have found that, with a Turks Head working at close to its maximum reduction, that is, its maximum bearing capacity, the operator will all too often attempt to increase production by increasing speed. Since it is a general rule that bearing capacity varies approximately inversely as the cube root of the speed, such an attempt will usually result in bearing failure. Figure 3 (in a previous article) showed a typical "capacity versus speed" curve, based on

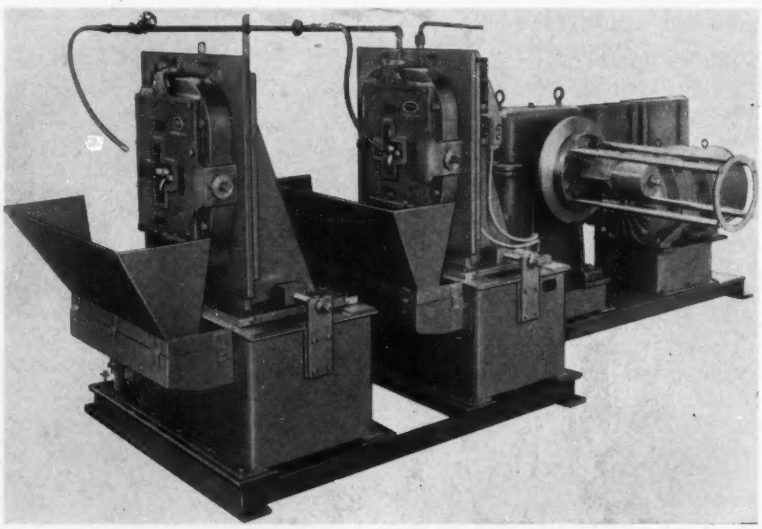

Fig. 7. Modern Wire Shaping Mill.

maximum square from round. Exceeding these delivery speeds will result in bearing failure, high maintenance costs, and lack of accurate size control.

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It is good practice to select a Turks Head of such a size that the maximum reduction required does not exceed two-thirds of its bearing capacity. It will be found that closer tolerances can be held, that roll wear will be greatly reduced, and that the machine will last a long time if this practice is followed.

Size of Starting Round

Because so many factors influence the size of starting round to be used, no hard-and-fast solution or formula can be given. For single pass operation through a Turks Head, round to square, the correct starting diameter is about 1½ times the side of the square, giving a 44% area reduction. For rectangles, with W/T ratio no greater than 2 to 1, the maximum reduction will be less than 44%, and will depend on the W/T ratio and on the metal used. It is usually possible to produce such a rectangle in one pass, if very sharp corners are not a requirement. If W/T ratio is greater than 2 to 1, a Turks Head and rolling mill combination is used. Our Field Service Engineering Department has accumulated much data on this subject, and will be glad to advise on specific applications.

Finning, Or Not Filling

Finning occurs when the cross-sectional area of the material entering the cavity formed by the rolls exceeds that required to form the section. This causes gaps at the four points of roll contact, which increase in size as the load increases. Where very sharp corners are desired, the stock must completely fill the roll opening, yet the pressure must not cause gaps sufficient to cause finning. If not excessive, this can be remedied by judicious preloading of the rolls; that is, each roll is set up firmly against the side of its neighbor, after which adjusting pressure is increased a predetermined amount. Now a portion of the load is required to counteract the roll preloading, beyond which point roll separation will begin. No rules can be laid down as to amount of preloading required, each case offering differing problems. Where commercially sharp corners only are required, the stock should exactly fill the roll opening and finning is no problem. Selecting the proper size of starting round is very important where very sharp corners are required, because there is a definite limit to the amount of preloading which can be applied.

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"Not filling" is the opposite of finning, in that the reduced section is insufficient to fill the roll opening completely. It is generally the result of too small starting size, but may also result when the pull exceeds the yield strength of the finished section, and the stock is "stretched" through the rolls, with reduction in area.

Tensile Strength

Tensile strength of the stock is a factor in determining the maximum reduction permissible and, secondly, in determining the size of the machine in which this permissible reduction can be accomplished. For a given reduction, the roll separating force is roughly proportional to tensile strength. It follows that an attempt to make a maximum reduction with a metal of higher tensile strength than that on which machine size was based may cause serious damage to the machine. Tensile strength affects the accuracy of finished dimensions in that closer tolerances can be held on metals of higher tensile strength.

Sections With Large W/T Ratio

One or more mills are required in tandem with the Turks Heads when the rectangle to be produced from entry round, in one pass, has W/T ratio greater than 2 to 1. Figure 8 shows such a line comprising two mills and two Turks Heads. This line has satisfactorily rolled rectangles as large as 1¼" x 5/8", from cold drawn mild steel starting round of 1 3/32" diameter, at 170 fpm, within tolerance of ± .0005". In this line, the first Turks Head performs a substantial vertical reduction; the second Turks Head acts as an edger and also reduces the thickness to within required tolerance. The latter is the usual function of the Turks Head in such a combination.

Tolerances

No article on Turks Heads would be complete without a review of tolerance expectations. Two actual case histories are cited below to demonstrate what is being achieved in those installations.

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Case A. One of the nation's largest producers of diesel equipment is presently manufacturing their piston ring stock in a Fenn No. 1204 Wire Shaping Mill. The entry material is 3/16" diameter oil hardened steel wire, which is

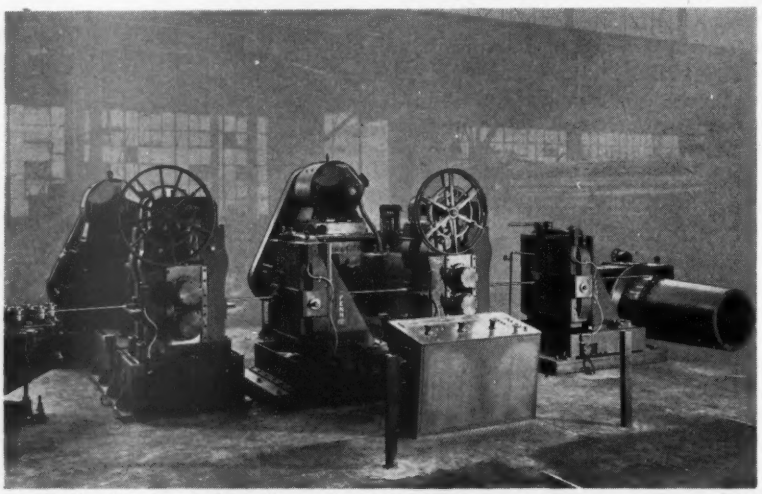

Fig. 8. Tandem line, two rolling mills and two Turks Heads. * * * * * * * * *

formed into a rectangle .130" x .134", with two grooves in the upper surface, at 150 fpm (see Figure 9). This operation was described in Automotive Industries, issue of September 11, 1953, page 64. When this installation was field tested by Fenn service engineers and accepted by the customer, the machine was holding a tolerance of ± .0002". The machine has been in operation for four years with only nominal replacement of parts.

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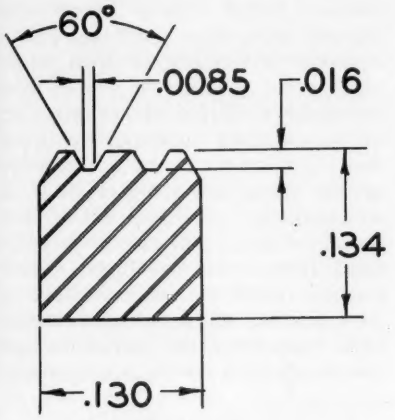

Fig. 9. Piston Ring Stock.

Case B. One of the leading steel suppliers in the middle west has recently installed Fenn Turks Head equipment to produce many of their square and flat sections, which are among their stock or catalog items. They are now producing in two passes through a Fenn No. 5U Turks Head what formerly required five draw die operations. What is even more important than the saving of production time is the fact that the end product is held to such close tolerance that it is now classified as "premium," and could be subject to a higher price.

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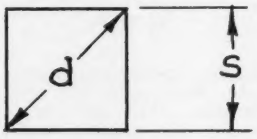
In both of these field studies listed above, the important feature is the close tolerance maintained, and the fact that these tolerances are not accidental. They are, instead, the result of careful selection of the proper size and capacity, combined with proper accessories, and by understanding and following correct operational procedures.

Case Studies

We would like to close this article with a few case studies which we believe will prove of interest and which may point out opportunities for further study.



Sketch 1

s = .285" ± .0005"
d = .395" actual
d = .403" theoretical

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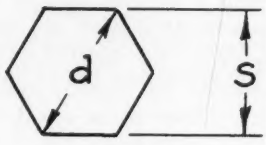
This section was produced in two passes in a 5U Turks Head from an entry round of monel of .435" diameter.



Sketch 2

s = .375" ± .0005"
(all flats within .001")
d = .429" actual
d = .433" theoretical

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This section was produced in a single pass through a tandem unit consisting of one 5P and one 5U Turks Head, with the 5U used as a P-type. Starting round of monel was drawn in one pass through die to .500" diameter, from an annealed condition, then passed through tandem Turks Heads at 100 fpm. Mineral oil was used for stock lubricating and cooling.

(See Sketch 2)

s = .322" ± .001"
d = .357" actual
d = .370" theoretical

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Produced in a single pass through a 5P Turks Head from entry round .377" diameter, hot rolled, at 100 fpm. The variation between theoretical and actual dimension was acceptable for the application, permitting single-pass operation.

(See Sketch 1)

s = .249" ± .0005"
d = .342" actual
d = .352" theoretical

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This section was produced in two passes in a 5U Turks Head at 100 fpm. Hot rolled wire, 7/16" diameter, was reduced in a die to .375" diameter, then passed through the Turks Head.

(See Sketch 1)

s = .083" ± .00025"
d = .116" actual
d = .117" theoretical

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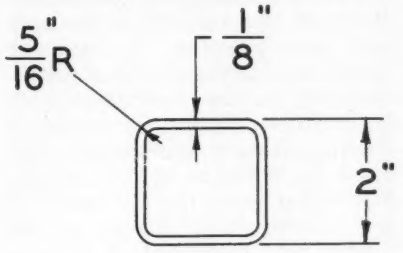
This section was rolled in a 3U Turks Head in one pass at 300 fpm. Entry round was high tensile strength, medium carbon, .125" diameter. As originally supplied, entry wire was heavily lime-coated, causing build-up of lime on the rolls, roll separation and formation of fins. Removal of lime coating before rolling eliminated all difficulties.



Sketch 3

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This section was produced in a single pass in a 6U Turks Head in conjunction with a draw bench, from 2½" hot rolled tubing.

Conclusion

Possibly all the avenues of Turks Head operation have not been explored in the detail that may be desired. It was our thought however that in future articles we may be granted the opportunity of pursuing this matter further and to comment on such subjects as power driven vs. friction type Turks Heads, and to outline plans for continuing development of this machine. However, we trust that this article has proved to be both interesting and informative to the readers of this publication.

Phosphate Coatings for Facilitating Cold-Working

by Dr. W. Rausch and Ing. H. Fleischhauer

Translated by
Jerome W. Howe, C. E.
Worcester, Mass.

This article, appearing in the December, 1953, issue of Draht, and printed here through their courtesy, describes the theory, the practice and the advantage of this type of coating in the drawing of wire.

The chemical and physical properties of a phosphate coating differ distinctly from those of the customary lubricant carrier such as lime, borax, etc. In contrast to these, the phosphate coating is formed by means of a chemical reaction between the phosphate solution and the material to be worked. This process creates a firm intergrowth of the coating with the material. The phosphate solutions are commonly aqueous solutions which contain a film-forming metal, preferably zinc and phosphoric acid.

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Through change of the proportions of the several components and the addition of oxidizing agents the strength and crystallization of the film is varied between wide limits, so that it is possible to manufacture appropriate solutions for different special applications. Moreover, the formation of the coating is influenced by the preparatory treatment of the material. In connection with the various phosphating systems, pre-rinsing solutions have been developed which permit between certain limits a variation of the coating by one and the same process. For example, by pre-rinsing with an alkaline phosphate solution containing titanic salt, it is possible to produce a tighter and finer-crystalline phosphate coating. This preliminary treatment is especially effective after alkaline degreasing or after pickling, because without such pre-rinsing in these cases the coating produced is essentially coarser-crystalline and less uniform.

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The influence of an alkaline or an acid preliminary treatment (degreasing or pickling) on the coarsening of the coating is connected with the manner of crystal growth in a phosphate solution. While on clean rolled material after degreasing in an organic solution, a large number of embryo crystals are present on the surface of the metal, which leads to the formation of many small crystals, by means of an acid or alkaline treatment a greater part of these nuclei are destroyed so that a coarse crystalline coating develops from the small number remaining.

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By means of subsequent application of crystal-forming nuclei (for example, a pre-rinse in which titanic salt is present in colloidal form) or by buffing of the surface (for example, by sand-blast) an improvement of the coating is obtained. The composition of the presently used phosphate solutions is based on the fundamental development work in the laboratories of the manufacturing firms, in which particular effort was directed toward stability of the solutions and uniformity of the coatings.

The Principle of the Phosphating

The phosphating solution, with coating-forming components zinc and phosphoric acid, is composed of such relative proportions of components that it is comparable in equilibrium with the coating composition,—in this case tertiary zinc phosphate. This relation depends upon the temperature of treatment; the working temperature of different processes must therefore be maintained constant within 5°C. An increase of temperature over the permissible range leads to stronger sludge formation, and increased use of chemicals. A lowering of temperature results in a less adhesive and cohesive coating. The chemical reactions which bring about the coating bring also a sludge, which consists principally of iron phosphates and in lesser degree of zinc phosphates. Sludge is troublesome because of the tendency to crust over the radiator and accumulate on the phosphated material. It is not entirely avoidable, but in the last two years phosphating solutions have been developed which contain catalysts and produce a finer grained sludge which is easily kept clear from the radiators and bath walls by a strong water spray.

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The aggressiveness of a bath depends upon the concentration of free phosphoric acid in the solution and the process temperature. The phosphating solutions which work within a range of from 40° to 70° C are appropriate only to coating of iron, unalloyed steel, zinc and aluminum. For the phosphating of steel with small content of chrome, manganese, wolfram, molybdenum or vanadium, one must use aggressive phosphating solutions (for example, draw bondered, double process, temperature 95° to 98° C). As a rule for this, it can be accepted that the aggressiveness of the solution increases with higher temperature and increasing concentration. It must be remembered that use of a higher temperature will require use of another phosphating system regulated upon it.

Properties of Phosphate Coatings

Phosphate coatings used for

(*Please turn to page* 599)

Hot Dip Galvanizing Is A Science

by Wallace G. Imhoff, President
Wallace G. Imhoff Company
Fullerton, California

Part IV

This fourth article in the series on galvanizing by Mr. Imhoff covers the principle that the longer the pickling time, the heavier the coating of zinc that will be deposited on the base metal.

There is a very important phase of hot dip galvanizing that is a vital factor of galvanizing costs. This is the preparation of the work for galvanizing, which includes cleaning and pickling. For many years it was not realized that if the surface of the base metal was not absolutely clean and the preparation of the surface was faulty, costs were greatly increased due to seconds, and work that had to be done over. One company, not knowing the importance of careful preparation before galvanizing, had the whole seventh floor of their warehouse filled with seconds and work that had been rejected because of bare and exposed steel spots. The connection between cleaning and pickling, upon the quality of the zinc coating had not yet been realized.

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At that time stamping and drawing compounds and greases were removed in the pickling solution, and every so often the pickler took a shovel with the handle cut off, and scooped off the heavy black accumulation of grease and drawing compounds from the surface of the pickling bath. It was not known that the high percentage of seconds having bare and exposed steel spots, was caused by the grease spots and film left on the steel surface as the article was drawn up out through this blanket of grease, that entirely covered the surface of the pickling bath. It took almost ten years to convince the galvanizing industry that the costs of a cleaning tank, a rinse tank, and a good commercial metal cleaner, was far less than the huge quantities of defective articles produced by trying to remove grease and drawing compounds in the pickling bath. Today every modern galvanizing plant has cleaning tanks in the pickling line.

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The purpose of pickling is to remove corrosion, iron oxides and scale from the steel surface, so that the clean bare steel surface will be exposed to the action of the molten zinc bath. Pickling and Hot Dip Galvanizing are really two separate sciences, but for all protective coatings, such as hot dip galvanizing, hot tinning, lead coating, cadmium coating, electroplating, and many other protective coatings, both cleaning and pickling are required before a satisfactory protective coating can be applied to the steel surface. Thus, if the removal of grease and drawing compounds is the first step, then the second step can be the satisfactory removal of all rust, corrosion, iron oxides and scales from the steel surface.

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Before materials known as inhibitors were discovered, many articles were destroyed in the pickling operations. This was due to the difficulty of properly removing all foreign matter from the surface of the steel. A plant in St. Louis manufactured galvanized steel bushel baskets used for handling coal. The warehouse was damp and cold, and by the time the baskets were taken out of storage to be galvanized, an extremely heavy crust or coating of rust had formed over them. The corrosion on these articles was so deep, that the finished articles when weighed on the scales, were found to have taken a far greater amount of zinc for coating, than the fresh, clean, normal baskets that came directly from the stamping department and had not been in storage. Such examples as this lead to a demand for a careful research program to determine the influence of pickling upon the amount of zinc deposited as galvanized coating. Two special research investigations were made. One was a very careful test on a laboratory basis to determine theoretically the relationship between the pickling time, and the weight of zinc deposited as galvanized coating. The second was a full scale practical plant investigation made under normal operating conditions to definitely prove that the conclusions drawn from the laboratory tests were correct. Both of these research investigations are herewith submitted below, which prove the principle, that "the longer the pickling time, the heavier the zinc will be deposited as galvanized coating."

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The method of procedure used in the laboratory tests was the following. Fifteen 6 x 6 inch blackplate, 28-gage sample sheets were used for the experiments. Beginning with a pickling time of one minute, the time was increased one minute for each sheet. This gave a series of sheets pickled from one to fifteen minutes. The time of submersion in the spelter bath was 10 seconds in each case. The withdrawal time was 5 seconds and the time to completely submerse the sheet in the molten zinc was 5 seconds, making the total time 20 seconds consumed for each sheet. The acid used in pickling the sheets was 4 percent, sulphuric acid at a temperature of 180 degrees F.

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The results of the tests for each

sheet are shown in Table 1.

TABLE 1

Sheet Number	Pickling Time	Total Galvanizing Time	Zinc Deposited in Grams
1	1 Minute	20 Seconds	19.50
2	2 "	" "	20.00
3	3 "	" "	19.60
4	4 "	" "	19.70
5	5 "	" "	20.80
6	6 "	" "	19.60
7	7 "	" "	Spoiled
8	8 "	" "	21.50
9	9 "	" "	21.40
10	10 "	" "	Spoiled
11	11 "	" "	22.40
12	12 "	" "	21.70
13	13 "	" "	22.10
14	14 "	" "	20.60
15	15 "	" "	22.60

Conclusions

1. **There can be no doubt of the overall result, namely, the longer the pickling time, the more zinc is deposited as galvanized coating.**
2. **The errors, irregularities, and actual spoilage of a couple of test sheets are a result of uncontrollable variables and the delicate fineness of test conditions.**

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Many scientific truths and facts can be correctly and reliably determined in the laboratory, but where many errors and variables are already inherent in the testing materials, then laboratory tests are much less reliable. For example, the actual thickness of one of the test sheets may have been under or over the other test sheet thickness, or the scale condition on one sheet may vary from the scale condition on others; even the chemical composition of the different sheets may vary slightly. Another feature beyond control is the actual surface condition of each sheet after pickling. No matter how carefully each test is carried out, all conditions may vary slightly from the conditions present when other sheets were galvanized. All these variables which are inherent first in the test sheets themselves, and then in the test materials and equipment, are beyond the control of the operator. Even with these uncontrollable variables and conditions the main facts that were sought after have been clearly established. There can be no doubt whatsoever that sheets pickled from 1 to 4 minutes will take on a lighter deposit of zinc as galvanized coating than the sheets pickled from 12 to 15 minutes, and the overall results clearly prove and show a gradual increase in the amount of zinc deposited as galvanized coating, with increase in pickling time. This was the purpose of making the tests, and the results are conclusive, in spite of the variables.

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No matter what laboratory results are, or how carefully laboratory tests have been made, there are always some people with a wholly practical background, that are always skeptical and question such tests as a final conclusion. To some extent they are right; but there are many types and kinds of laboratory investigations that cannot be adapted to actual plant practice. In the case of pickling practice and principles this is not the case, and a full scale research investigation on a practical plant operating scale was welcomed as additional proof that the findings in the laboratory were correct.

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Accordingly then, the purpose of the next investigation was to verify in practice, under normal operating plant conditions, that the principle, "the longer the pickling time, the heavier the zinc will be deposited as galvanized coating," is also true under the normal plant operating conditions.

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The method of procedure is described.

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The tests were carried out on a 16 quart size, heavy grade, water pail, pickled and hot dip galvanized in the usual manner, and under all of the normal operating plant conditions. Each lot consisted of 72 pails which were weighed dry black, and then weighed wet black after being dipped in water. They were then pickled in dilute sulphuric acid of 4% strength, at a temperature of 118° F., weighed again, and then galvanized in the usual manner known as standard practice for that article. They were finally weighed again after being galvanized.

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The complete results are shown in Table 2.

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As a general rule in practice pickling operations are regulated to keep a uniform supply of work in the galvanizing kettle. The pickling time in all cases should be as short as possible, and still have the articles pickled properly. This will insure the lightest zinc deposit, and will also decrease the acid consumption by the amount of acid which dissolves the iron under the scale.

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A very important operation of pickling is to see that the work is wet at all times before it goes into the flux box. A dry surface will invariably be covered with flux spots. A certain amount of water is necessary to develop the proper reactions in the flux box. The flux cannot slip off the surface when it is dry; therefore the flux sticks on the surface and is carried down through the bath and appears as flux spots on the surface of the galvanized article. Therefore, articles to be galvanized should be placed on the drain rack only, a short time before they are to be used. On the other hand they should not be too wet or an explosion is likely to take place in the flux box.

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Once again, and this time under normal operating practical conditions, it has been proven that, "the longer the pickling time, the heavier the zinc will be deposited as galvanized coating". There is also a corollary to this principle, namely, "the heavier the corrosion, the longer the pickling time, and therefore the heavier the zinc will be deposited as galvanized coating".

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In addition to the tests made in the laboratory and under actual practical operating plant conditions, additional evidence for the basic reasons as to why more zinc is deposited with a longer pickling time, was obtained to show the effect on the smoothness of the surface. To include corrosion and scale factors also, different kinds of base metal were pickled different times, and then the steel surface was viewed under the microscope to see the different etching depths due to the different pickling times, and the different surface conditions.

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Table 2

PAIL, WATER, HEAVY GRADE, -16 QUART

Controlled Pickling Time

Batch	1	2	3	4	5
Quantity	72	72	72	72	72
Dry Black	193	193	193.5	193.5	192.5
Wet Black	197	197	197.5	197.5	197.5
Water	4	4	4	4	5
In Pickle	10.25	11.12	9.00	8.00	1.35
Out Pickle	11.15	1.10	11.10	10.28	4.35
PICKLING TIME	70	118	130	148	180
Wet Pickled	194	193.5	194	193	193.5
Dry Pickled	190	189.5	190	189	187.5
Scale	3	3.5	3.5	4.5	5
Galvanized	238	238.5	241	241	241
Zinc	4 8	49	51	52	53.5

Average Pickle Temperature 118 Degrees F.

Galvanizing Record

	1	2	3	4	5
Started	2:46	4:04	2:00	1:27	10:45
Stopped	3:21	4:41	2:36	2:00	11:29
Time	35	37	36	33	35
Rest Period	10	8	0	11	10
Quantity	72	72	72	72	72
To Flux Box	.05	.04	.04	.04	.04
Through Flux	.13	.12	.13	.14	.12
Submersion Time	.39	.42	.38	.41	.40
Withdrawal Time	.16	.17	.18	.15	.15
To Pile	.16	.17	.16	.16	.17

The first set of samples were obtained from pickling the Hot-Rolled and Annealed Base Metal with no further treatment. The test samples were then pickled 3 minutes, 15 minutes, and 25 minutes. The surface conditions of all sheets can be compared as to depth of acid etching, and roughness. The rougher the surface, with deep etching, will as shown above, be a definite cause for a heavier zinc deposit as galvanized coating. A smooth level surface will naturally take on a lower weight of zinc deposit, than one which is wavy, due to deep etching. In the latter type the "valleys" have to be filled up with metal, thus requiring more zinc than a smooth level surface without any valley depths. The different steel bases with their different surfaces after pickling, show how more metal is required with longer pickling time, and deeper acid etching of the surface.

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The graph showing the results of the influence of the length of pickling time on the weight of zinc deposited as galvanized coating under practical conditions, verifies the graph made in the laboratory. Both show conclusively that, "The longer the pickling time, the heavier the zinc will be deposited as galvanized coating." It can therefore be stated as a true hot dip galvanizing principle.

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It is always of interest to attempt to explain the irregularities that generally accompany any test whether made in the laboratory, or under practical plant operating

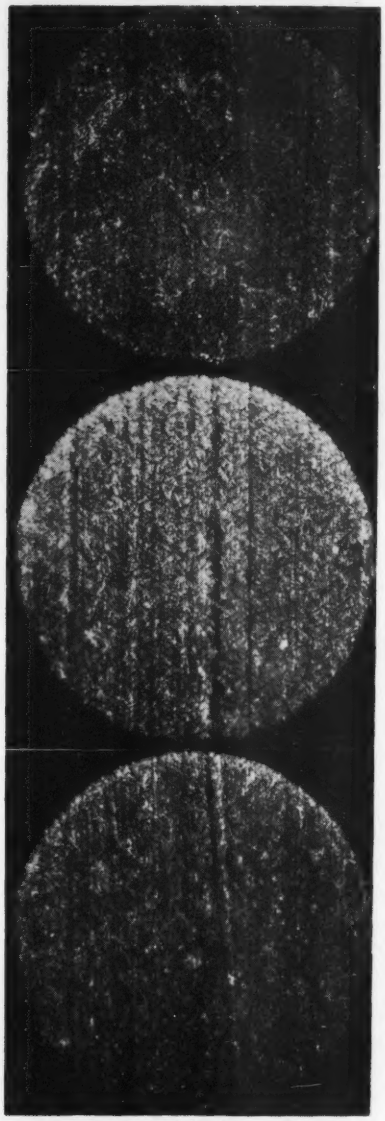

Plate I
Hot rolled and annealed base metal. Pickling times 3 minutes (top), 15 minutes (center), and 25 minutes (bottom). * * *

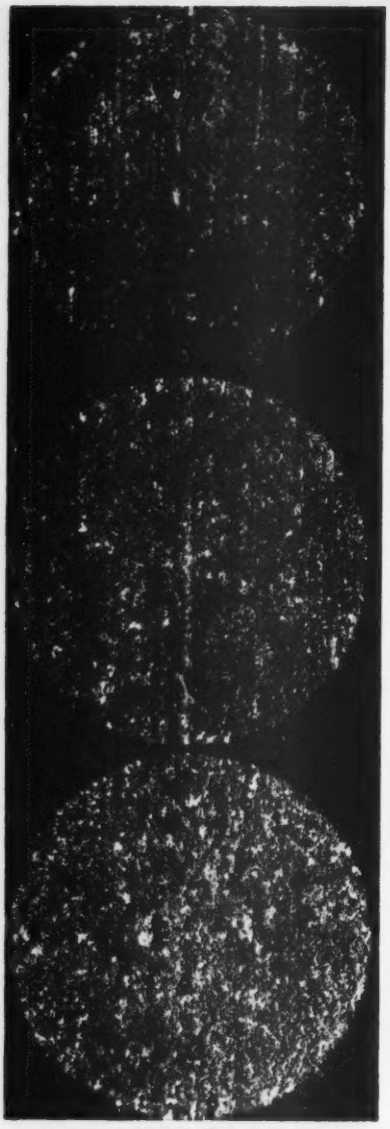

Plate II
One-pass cold-rolled steel base—O.P.C.R.

Pickling time 3 minutes (top), 15 minutes (center), and 25 minutes (bottom). * * *

Plate III
Pickled and annealed steel base—P&A.

Pickling time 3 minutes (top), 15 minutes (center), and 25 minutes (bottom). * * *

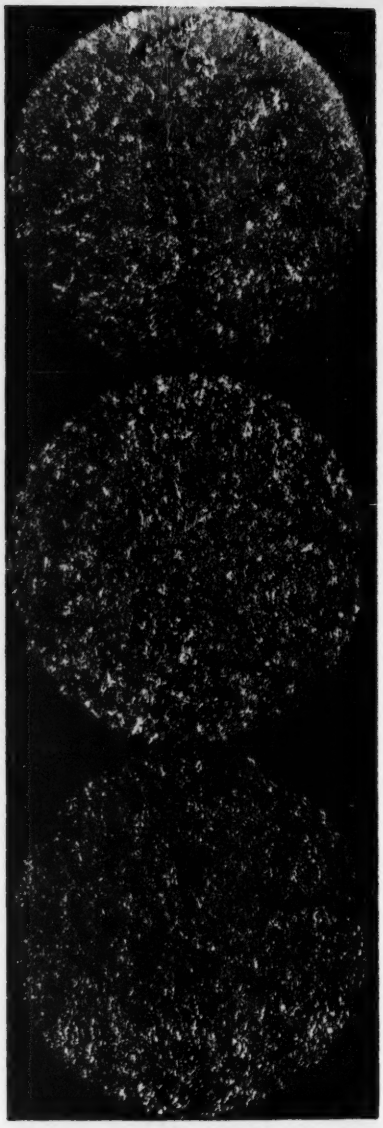

Plate IV
Full finished steel base.

Pickled 3 minutes (top), 15 minutes (center), and 25 minutes (bottom). * * * * *

conditions. One most important factor that all practical galvanizers know and understand thoroughly, is that when first starting up, whether it be in the morning, or afternoon, operating conditions are always erratic and results vary greatly until the "bugs" have been worked out of the solutions. As a typical example of what is meant by the "bugs", at night when operations cease, the flux in the flux box is carefully scooped out, but it is impossible to get all of the flux, and some sticks around the edges of the box.

This flux not only burns overnight, but since the bath temperature is lowered, it sticks as a border of burned flux onto the sides of the flux box. Thus when first starting up again, no matter what the time, this burned cold flux floats loose as undigested flux, and is carried out on the work as "flux spots" for perhaps an hour after new operations begin. The same erratic operations also occur in the pickling operations as may be noted by the bulge in the actual curve in the graph made under practical operating plant conditions.

There can be two possible explanations for this behavior — first, the scale may have been a little harder to remove, or there may have been some grease, oil or drawing compound left on the articles. This batch of articles may have been the first batch made after operations started in the stamping department. Once pickling and galvanizing operations get well under way, with the solutions hot, the strengths properly adjusted, etc., then the results become more uniform. It is these

(*Please turn to page* 605)

Engineering Polyethylene for Wire and Cable

by E. J. Burrough and E. E. Lewis
Polychemicals Department
E. I. duPont de Nemours & Co., (Inc.)
Wilmington, Delaware

A paper prepared jointly by Mr. Burrough and Dr. Lewis, presented at the Third Annual Wire and Cable Symposium sponsored by the Signal Corps Engineering Laboratories at a meeting held in Asbury Park, N. J. on December 8, 1954.

Polyethylene is established now as a remarkably versatile plastic for wire and cable insulations and jackets. Great strides are being made in engineering this material for the specific needs of the industry. Performance has been improved both by basic changes in the molecular structure and advances in compounding with improved stabilizers and other ingredients.

★ ★ ★

Much has been learned in recent years about controlling, through the synthesis conditions, the form of the polyethylene molecule and the gross properties of the product. Let us review briefly the fundamentals covered in detail by Roedel, et al[4]. By addition polymerization, ethylene combines with itself to develop a long-chain molecule. The reaction is initiated and propagated by a free radical, as shown in equations (1) and (2):

$$R^{\bullet} + CH_2 = CH_2 \longrightarrow RCH_2CH_2^{\bullet} \quad (1)$$
(Initiation)

$$RCH_2CH_2^{\bullet} + n\text{-}1\ CH_2 = CH_2 \longrightarrow R(CH_2CH_2)_n^{\bullet} \quad (2)$$
(Propagation)

Chain growth can be terminated by transfer, disproportionation or pairing, as shown in equations (3), (4), and (5).

$$R(CH_2CH_2)_n^{\bullet} + CH_2 = CH_2 \longrightarrow R(CH_2CH_2)_{n-1}CH = CH_2 + CH_3CH_2^{\bullet} \quad (3)$$
(Chain Transfer with Monomer)

$$R(CH_2CH_2)_n^{\bullet} + R'(CH_2CH_2)_p^{\bullet} \longrightarrow R(CH_2CH_2)_{n-1}CH = CH_2 + R'(CH_2CH_2)_pH \quad (4)$$
(Termination by Disproportionation)

$$R(CH_2CH_2)_n^{\bullet} + R'(CH_2CH_2)_p^{\bullet} \longrightarrow R(CH_2CH_2)_{n+p}R' \quad (5)$$
(Termination by Pairing)

Straight chain molecules formed in this fashion can vary widely in average molecular weight, which has a strong effect on such properties as ultimate tensile strength, melt viscosity, Vicat temperature, low temperature brittleness, and resistance to "stress cracking". Other properties, however, remain constant with wide variations in molecular weight.

★ ★ ★

We know now that these molecules are not simple straight chains. They can be very highly branched. Further, there are two kinds of branching, and each type affects the polymer properties in a different way. First, there is "long-chain" branching as proposed by Flory[1] and substantiated by experimental evidence, the mechanism of which is shown in equation (6). A growing chain takes a hydrogen atom from a completed molecule. This terminates the former, but leaves an active point in the latter. From this point a side chain grows. Such a branch can reach considerable length before it in turn is terminated by one of the mechanisms mentioned above.

$$R_1CH_2CH_2^{\bullet} + R_2CH_2CH_2R_3 \longrightarrow R_1CH_2CH_3 + R_2\dot{C}HCH_2R_3 \quad (6)$$

The most important effect of this type of branching is on the characteristics of the molten polymer. As the branching increases and the plastic melt departs progressively further from pure Newtonian behavior, the melt becomes more elastic. In other words, a high degree of long chain branching makes the polymer more difficult to extrude.

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The other, or "short-chain" type of branching is of greatest interest in wire and cable. Here we have an intramolecular process. As shown in equation (7), the end of a growing chain can curl back and form a transient ring. When this reopens, hydrogen can transfer to the once-active end. Polymerization then continues from the new active center, leaving a short chain branch of about four carbons.

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This short-chain branching affects directly the crystallinity of the polyethylene. As branching is reduced, crystallinity increases. This in turn leads to improvement in properties such as yield point, stiffness, heat deformation and melting point. The strong influence of crystallinity on melting point is clearly shown in Figure 1.

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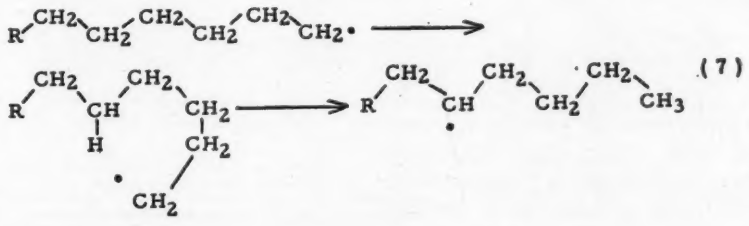

POLYETHYLENE RESIN--
MELTING POINT VS. CRYSTALLINITY

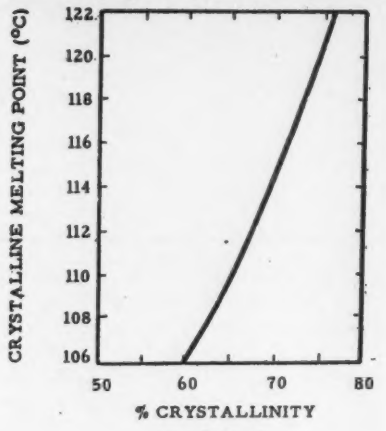

FIG. 1

Higher crystallinity thus leads to improvement of several of the properties important in wire and cable.

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Summarizing, Figure 2 depicts the variety we encounter in polyethylene molecules, with various combinations of kinds of branches. This variety extends, of course, over a vast range of molecular weight.

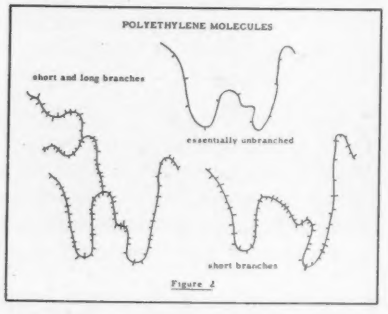

Figure 2

Table I brings together the three basic parameters, molecular weight, long branches and short branches with a qualitative picture of their effects on properties. The plus and minus signs indicate direct and inverse variations. The number of signs indicates the relative strengths of the various effects.

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With this knowledge of polyethylene structure, it was possible to produce better polymer for wire and cable. Short chain branching has been reduced in "Alathon" *5 polyethylene resin (the general purpose electrical grade) to give greater crystallinity and toughness. Long chain branching is kept at a minimum to insure good processibility. Also, an additional product of similar crystallinity and higher molecular weight, "Alathon" 3, is now on the market. The properties of these new products are shown in Table II. The yield point, a good index of toughness, is higher in these more crystalline resins. Elongation is well above practical requirements. Hardness is up with both crystal content and molecular weight. We have not stressed abrasion resistance in this discussion because of the difficulty in finding a reliable test. The Randall-Stickney values, taken togeth-

(*Please turn to page* 593)

BASIC "ALATHON" POLYETHYLENE RESINS

PROPERTY	"ALATHON" 5 (High Crystallinity)	"ALATHON" 3 (High Crystallinity; High Molecular Weight)
Melt Index	1.6	0.3
Tensile Strength	2,000	2,300
Yield Point	1,600	1,600
Elongation	550	600
Hardness (Shore)	C 81, D 48	D 52
Abrasion-Resistance (GE scrape test)	2,900	6,100
Deformation (Randall-Stickney) @ 95°C.	0.7%	0.2%
Deformation (Randall-Stickney) @ 108°C.	8%	
Deformation Temp. (Vicat)	95°C.	98°C.
Crystalline Melting Point	117°C.	117°C.
Cold Brittleness Temperature	< -76°C.	< -100°C.
Water-Absorption	0.014%	0.014%
Dielectric Strength (Short time, 70 mils)	1,100	1,100
Power Factor (10 KC to 3000 MC)	< .0004	< .0005
Dielectric Constant (10 KC to 300 MC)	2.27	2.27
Volume Resistivity	10^{17}	10^{17}
Surface Resistivity	2×10^{16}	2×10^{16}

(These are average values and should not be construed as specification limits.)

TABLE I

EFFECT OF MOLECULAR WEIGHT AND BRANCHING ON THE PHYSICAL PROPERTIES OF POLYETHYLENE

	Increasing		
	Molecular Weight	Short Chain Branching	Long Chain Branching
Physical Properties			
Melt Viscosity	+++	0	?
Crystallinity (Density)	0	---	0
Melting Point	0	---	0
Mechanical Properties			
Stiffness	0	---	0
Yield Point	0	---	0
Ultimate Strength	+++	0	-
Elongation	+	+	-
Thermal Properties			
Cloud Point	0	--	0
Vicat Temperature	+	--	0
Misc. Properties			
Sorption of Reagents	0	+++	0
Melt Extensibility	---	0	---

+ indicates direct variation

- indicates inverse variation

number of signs signifies degree

*"Alathon" is the registered trade-mark for DuPont polyethylene resins. * * * * *

The American Chain and Cable Story

by Emerson H. Todd, Sales Manager
American Cable and Hazard Wire Rope Divisions
American Chain and Cable Co.
Wilkes-Barre, Pennsylvania

The occasion for this interesting history of the origins and growth of one of our pioneer wire concerns was a press conference in Wilkes-Barre at which the new VHS cable and its manufacture were shown. The saga outlined by Mr. Todd is reminiscent of those written by Kenneth B. Lewis on early wire making companies a few years ago.

Last year the **American Chain & Cable Company** observed its 50th Anniversary, the original unit having started in 1904 as the Weed Chain Tire Grip Company. Today our company is comprised of some 21 divisions and subsidiaries, spread over the United States, Canada and England.

★ ★ ★

More than 100 essential products are now manufactured, ranging from wire rope, lawn mowers, cushion and mattress springs, automotive and aircraft controls—all of which are produced in the Wilkes-Barre area—to fencing, hardness testers and control and recording instruments. The company's annual sales total about $100,000,000.

★ ★ ★

Wilkes-Barre is the home of the **American Cable** and **Hazard Wire Rope Divisions.** The former **American Cable Company** joined the ACCO family in 1925, with the **Hazard Wire Rope Company** following suit in 1930. The origins of the latter company are particularly colorful, going back to Revolutionary days, and being closely associated with the development and growth of the anthracite coal industry in this area.

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Hazard is a singularly strange name for a wire rope on which so much depends, but it happens to be the name of the founder of the original wire rope company bearing this famous name. This was **Erskine Hazard,** born in 1789, son of the first Postmaster General of the United States, who was as rebellious in the engineering field as his forefathers had been against the tyranny of England.

★ ★ ★

At an early age, estimated to be around 18 years, **Erskine Hazard** went into a partnership with **Capt. Josiah White** which lasted many years. Their first venture was an iron foundry and iron mills at the falls of the Schuylkill River near Philadelphia. Many of the cannon balls used in the War of 1812 were cast there.

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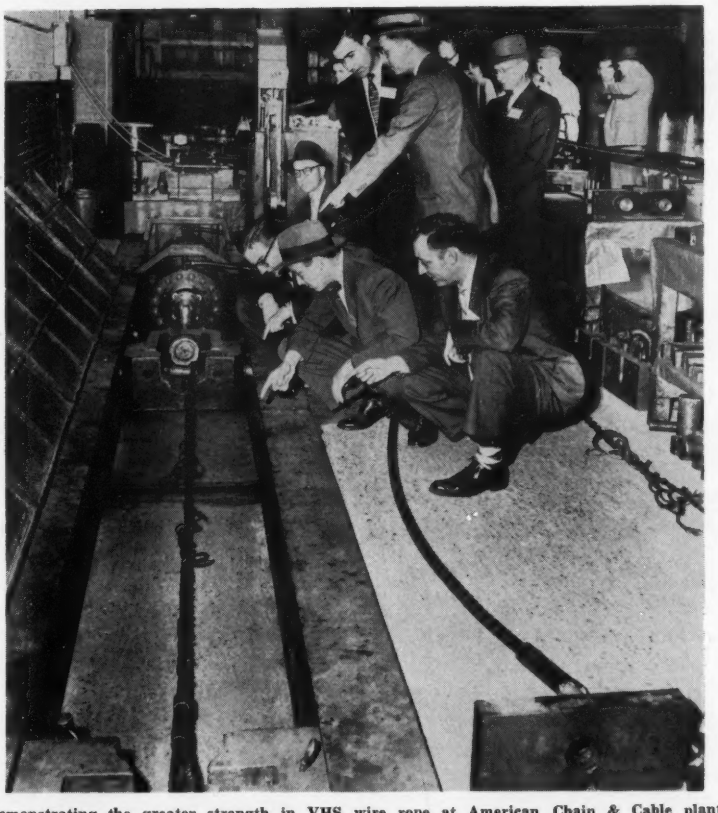
In 1815, Erskine Hazard and Capt. White designed the first wire suspension bridge to be built in America. They drew the wire in their own mill and erected the bridge to span the river at their plant site. This bridge was 410 feet long, remarkable for those days, and planked to a width of 18 feet. The total weight of the bridge was 4702 pounds and was erected at a cost of $125.00. To repay this cost, a toll of 1c per person was charged until the original cost had been returned.

(*Please turn to page* 590)



Demonstrating the greater strength in VHS wire rope at American Chain & Cable plant at Wilkes-Barre, Pa. When loaded into a 250,000 pound hydraulic testing machine and pulled to destruction, a 1-inch diameter VHS rope broke at 107,500 pounds—4,200 pounds over the catalog breaking strength. A 1-inch diameter rope of improved plow steel has a breaking strength of 89,890 pounds. In 1½-inch diameter ropes, the difference in tensile strengths is 29,600 pounds. ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Pressurized Die For Wire Drawing

by Maurice P. Milliken
Research and Development Consultant
Cuyahoga Falls, Ohio

In this article the author offers a deductive suggestion to wire and wire drawing die manufacturers, by which, if it could be made practicable, die lubrication could be made positive, with resulting beneficial effects, both on the wire and the dies. From here it is hoped that some one—or more—will conduct experiments for their own and the industry's advantage.

In spite of a long history of use, there seems to be much to be desired in knowledge of the fundamental phenomena involved in wire drawing, stresses, friction, heat, plasticity, etc. Although much knowledge of this nature is needed, the large gap between theory and practice still indicates the most economical development approaches to be from the practical and short term side, with perhaps some theory leading the way. One practical observation that often has been made is that a better lubrication of the drawing surface would help. Because die lubrication must precede each die one might conclude that the effect of present lubricators and drawing compounds does not extend very far inside the die.

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Fig. 1 illustrates an approach intended to put the lubricant where it is needed, farther inside the die. The porous nature of the die is utilized as a passage for the lubricant from a high pressure source. Many questions of practicability immediately arise, for example it isn't known that the die material can be made porous enough for an adequate passage.

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But the form may expand our thinking along more practical lines. If passages are formed in the die and specifically if they are connected at the ID of the die by a circular groove, the device begins to resemble two dies in succession with pressurized lubricant in between. In this form we can at least measure the variables and relate them to results by cause and effect.

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Fig. 2 represents such a version with lubricant supplied to the space between the dies. With the dies serving as seals it is probable that very high pressures can be used. The first die need not perform a large reduction, say only 1% to 10% for a pressure seal, in which case the tension behind it will probably not be too great for the wire. Because of the inward movement of the wire, even 0% reduction at the first die will provide an effective seal for low pressures. Theoretically a certain amount of tension here should assist the necking down at the main working die; in multistage machines tension ahead of the die is tolerated, if not actually beneficial. The construction shown allows for providing positive circulation of lu-

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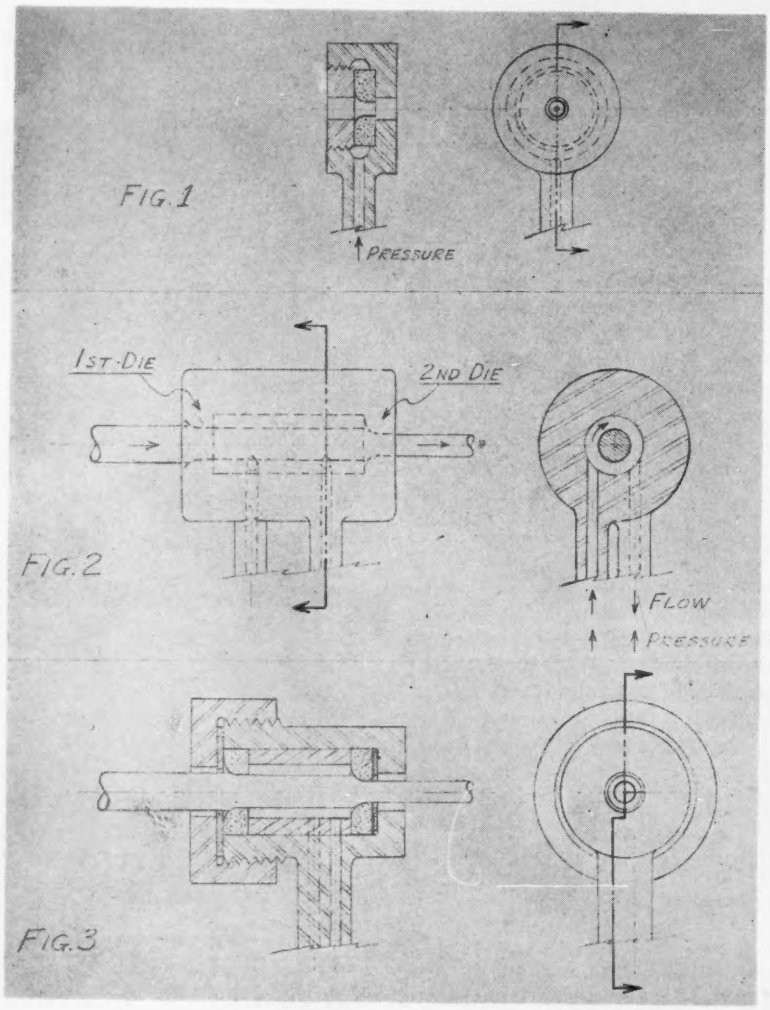

Puerto Rico Gets $3,500,000 Steel And Wire Mill

by Hamilton M. Wright
Hamilton Wright Organization, Inc.
New York, N. Y.

While the establishment of this wire mill in Puerto Rico has been a matter of considerable moment to the island's economy, it is also of interest to the American wire industry as indicative of the trend toward the wider distribution of wire producing units.

A steel wire company has recently been organized and is now in operation in Puerto Rico.

★ ★ ★

The Gulf Steel & Wire Company has constructed a 135,000 square foot converter mill to manufacture chain, nails and wire products for all commercial uses. It is the only such finishing mill between the northeastern region of the U. S. and Brazil. Its great service to the Puerto Rican economy, in addition to the jobs it creates and the wages and salaries it pays, will be as a core industry supplying finished steel items produced locally to factories already established in Puerto Rico and those planning to start operations in the future. Gulf Steel products will speed local operations in the fields of construction, sugar industry, mattress manufacture, communications, shipping, packing and crating, among others.

★ ★ ★

Items being manufactured by the company include electric welded chain, welders' chain, jewelry chain, nails in all commercial sizes and types, low and medium carbon, spring and galvanized wire, chain link fence made from steel, copper-weld or aluminum in all commercial sizes and finishes, reinforcing mesh for concrete pipe and other concrete construction, galvanized barb wire, arc welding and gas welding electrodes and wire forms to specification. Presently 80% of the company's tonnage output is going to the United States and Canada with the remainder being sold in Puerto Rico and South America. In the near future it is anticipated that this will swing to 60-40.

★ ★ ★

The company presently employs some 350 Puerto Ricans who take home about $420,000 a year in wages and salaries. By the end of 1955, when it is expected that the plant will be operating at capacity, they will have about 700 employees—on three shifts—with annual salaries totaling more than $700,000. Capacity production is 48,000 tons of steel products and 12,000 tons of aluminum products annually.

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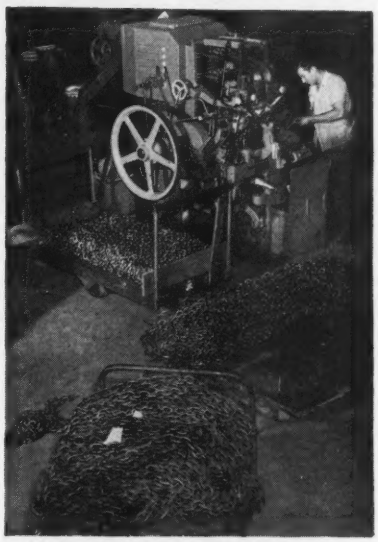
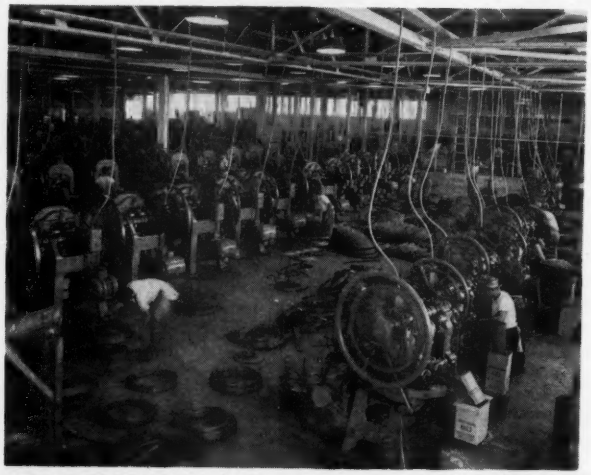


Automatic Chain Welding Machine.

Stacking Chain Link Fencing prior to shipping.



View of Nail-Making Department.

Chain Forming Machines.

Government Wire Production Information

New NBS Publication

A new Biennial Report for 1953 and 1954 has been issued by the **National Bureau of Standards:** National Bureau of Standards Miscellaneous Publication 213, 162 pages, 60 cents (Order from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.).

★ ★ ★

This report summarizes the research and development activities of the National Bureau of Standards in the physical sciences during the fiscal years 1953 and 1954. Brief descriptions are given of representative accomplishments in each area of the Bureau's responsibilities, which include maintenance of basic standards, determination of physical constants and properties of matter, development of methods and instruments of measurement, and the provision of calibration, testing, and scientific advisory services.

★ ★ ★

Also included is a discussion of the administrative changes growing out of the recommendations of a special Ad Hoc Committee appointed by the Secretary of Commerce to evaluate the Bureau's program in relation to national needs. For example, a number of technical advisory committees have been established by leading scientific and technical societies to advise the NBS Director in specific technical areas.

★ ★ ★

During the two years, significant results were achieved in programs dealing with electronic computers, electronic instrumentation, and the properties of matter and materials. A new high-speed computer—DYSEAC—which controls and responds to a variety of external devices, was completed and delivered to the Department of Defense. Low-temperature alignment of radioactive nuclei provided new approaches to the study of nuclear disintegration processes. A special ceramic coating was developed for high-temperature protection of alloys in nuclear reactors. Also developed were an electronic instrument that automatically detects changes in a patient under anesthesia, and a remotecontrol system for automatically measuring radiation intensities and weather conditions in the vicinity of an atomic explosion. Of particular significance was the development of an "X-ray televising" system in which high-energy X-rays may be passed through thick metal objects and then converted to visible light for viewing on closed-circuit television. Also described is a new approach to the design and automatic production of electronic equipment which has excited considerable industrial interest.

★ ★ ★

MICROMETER PRECISION — MICRO-WELD — TRADE MARK REGISTERED

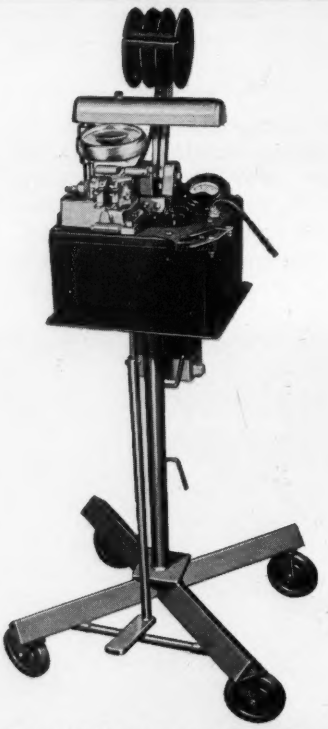
MODEL S.E.M.T. MICRO-WELD BUTT WELDER

This welder was designed and developed expressly for welding all types of fine wire: Aluminum, Copper, Brass, Bronze, Steel and Steel Alloys, ranging in size from .005" to .020" diameter.

Unit design of frame, transformer and power sub-assemblies permit other range of sizes to suit requirements.

Equipped with a temperature indicating annealing and tempering device, voltage regulator and meter to compensate for voltage fluctuation, wire cutters, extra large 5" diameter magnifying glass, fluorescent light and extension cord. Welder can be supplied for bench mounting, or mounted on 4-wheel truck.

The adaptability of this unit for welding all types of wire, either ferrous or non-ferrous, in sizes from .005" to .020" diameter, makes it ideal for the fine wire manufacturer.



MICRO PRODUCTS CO.,

20 NO. WACKER DR., CHICAGO 6, ILL.
Telephone: STATE 2-7468

A number of advances are also reported in fundamental standards and methods of measurement. To meet the requirement of modern industry, the range of the primary standard of pressure was extended from 50,000 to 200,000 pounds per square inch. A standard method was set up for calibrating the small, intense sources of beta radiation used in medical treatment. A radio-frequency permeameter was developed to provide an accurate secondary standard of complex permeability for quality control in the manufacture of magnetic materials.

★ ★ ★

The biennial report is composed of five sections: (1) a general review or summary, (2) a resume of the Bureaus' research and development work in progress or completed during the 1953 and 1954 periods, (3) a review of the testing and calibration program, (4) a discussion of the Bureau's various cooperative activities, and (5) an appendix consisting primarily of statistical and organizational material and a complete list of publications by NBS staff members for the two fiscal years.

(NOTE: Foreign remittances must be in U. S. exchange and should include an additional one-third the publication price to cover mailing costs).

New Ceramic Tool Cuts Steel Like Cheese

The United States government scientists recently unveiled a new cutting tool, made from easy-to-get aluminum oxide, which cuts steel like cheese and may make this country relatively independent of foreign-produced strategic tungsten.

★ ★ ★

It may speed both the war-materials and peacetime industry of the country. It may cheapen the price of machined metal products. And it is expected to find its way into the basement shops of home craftsmen.

★ ★ ★

The heart of the new tool—developed for American industry at the General Thomas J. Rodman la-

The above Knurled Head Machine Screw represents another difficult cold heading job successfully accomplished at lower cost per unit by Keystone "Special Processed" Cold Heading Wire.

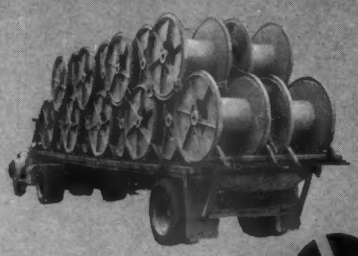
The superior grain flow characteristics of "Special Processed" Wire provide the desired upsetting and die forming qualities necessary to form the thin head section without cracking. The structural soundness and uniformity of "Special Processed" Wire further proved itself by trouble-free machine operation, longer die life and a finished product of the highest quality.

On your next recessed head or other difficult cold heading job, try "Special Processed" Wire. See your Keystone representative or write for more information.

Keystone Steel & Wire Company
Peoria 7, Illinois
Industrial Wire Specialists

There's no premium on INGENUITY at NYECO

Here are 32 Steel Shipping Reels being delivered on 1 especially rigged truck. One more example of the versatility and flexibility that go into every NYECO job . . . that make for happy customer relationships.



NYECO Steel Shipping Reels

YOUR BEST BUY!

because they cost so little more, last *12 times* longer than wooden reels, require minimum maintenance. Rugged weatherproof, splinter-proof, warp-proof construction protects costly cable against damage due to dropping, bouncing, rough handling. It doesn't pay to risk an investment of thousands on inferior reels.

ANY QUANTITY | ANY SIZE | ANY LOAD | FLANGE DIAMETER FROM 36" UP

SERVICE IS OUR BUSINESS: Qualified engineering staff will translate your problems into practical designs, from idea to finished product—or we'll work from your blueprints. 2 large modern plants with every automatic production facility, 100 in skilled personnel. Fast deliveries—motor, rail, water shipping at the premises.

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These leading mills prefer NYECO Steel Reels: OKONITE, ROEBLING, WESTERN ELECTRIC, GENERAL CABLE, ANACONDA, PHELPS DODGE

boratory of the **Army Ordnance Corps Watertown Arsenal**—looks like a piece of chinaware, or a bit of tile from your bathroom floor. Yet this ceramic material sliced hard steel like an apple-paring.

★ ★ ★

It may lead to the development of super high-speed lathes and other machine cutting tools because it is free from the overheating limitations which reduce the cutting speeds of both high speed steel and even the tungsten-cobalt carbides.

★ ★ ★

The Rodman laboratory was dedicated only last May for reducing to actual practice what the scientist says is possible.

★ ★ ★

ASTM Standards on Metallic Electrical Conductors

This publication should be in the hands of every concern manufacturing bare copper, copper alloys, copper covered steel, aluminum and iron and steel wire used in electrical conductors, as well as those who produce electric wire and cable.

★ ★ ★

It contains specifications on those materials for which the **ASTM Committee B-1 on Wires for Electrical Conductors** has been concerned, embracing rod, bar, shapes, tubing and wire used in the manufacture of conductor end parts. Specifications for bunch-stranded and stranded cables, for trolley wire, steel core wires, lead zinc, tin are given, together with approved methods of testing.

★ ★ ★

Single copies cost $3.25 each, but specific copies of approved or tentative standards may be purchased separately. Send orders to the **American Society for Testing Materials,** 1916 Race St., Philadelphia 3, Pa.

Screw Man on Board of NSMPA

Stuart R. Booker, Federal Screw Works of Detroit and Chelsea, Michigan, was elected to the Board of Trustees of the **National Screw**

Machine Products Association at its annual winter board meeting held at the Hotel Cleveland. The term extends for two years ending in 1957.

★ ★ ★

Mr. Booker is active in the affairs of the NSMPA Michigan District, and is a member of the national group's Statistics Committee. The National Screw Machine Products Association is composed of 280 manufacturers of screw machine products located throughout the United States, Canada, and Australia.

New Book on Titanium

The third publication in the Alloys of Iron Research New Monographs Series, "Titanium in Iron and Steel" by George F. Comstock was published in February by **John Wiley & Sons,** 440 Fourth Ave., New York 16.

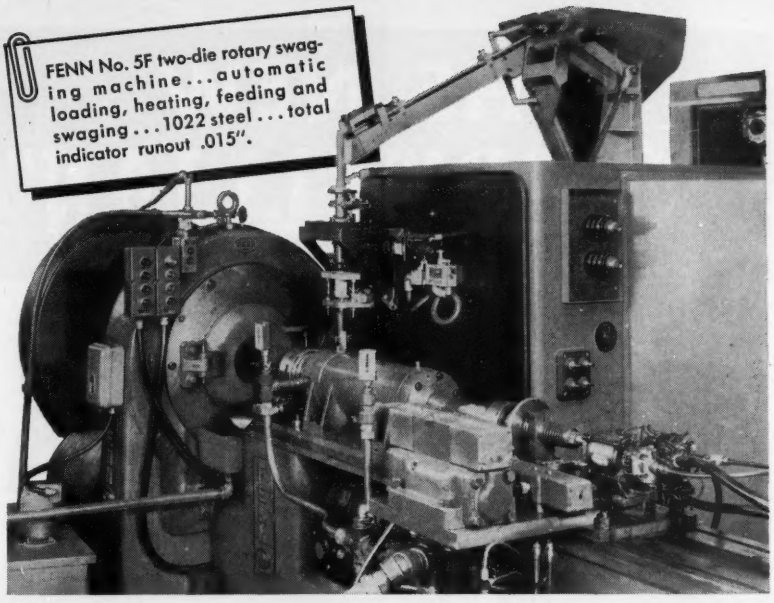
★ ★ ★

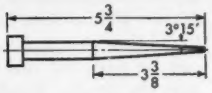
The book reviews and correlates all the important published data on titanium as an alloying element in iron and steel. Nearly 300 papers, all listed in the 15-page bibliography at the end of the book, were scrutinized for material that would be of value to the metallurgist, steel worker, foundryman, and engineer.

★ ★ ★

Starting with a general discussion of titanium and its minerals, and including the details on principal sources, concentration, preparation, and related fundamentals, the book proceeds to the working aspects of titanium. Full chapters are devoted to titanium as a deoxidizer in rimmed and killed wrought steels, the effects of titanium on nitrogen and sulphur in steel, titanium in cast steel and cast iron, general effects of titanium as the sole alloying element in pearlitic steels, and titanium in low-alloy steels. The concluding chapters cover carbide stabilization by titanium in unalloyed steels or steels of less than 4% alloy content and in steels containing over 4% chromium, and titanium in precipitation-hardening steels and in complex heat-resisting alloys.

★ ★ ★


FENN No. 5F two-die rotary swaging machine... automatic loading, heating, feeding and swaging... 1022 steel... total indicator runout .015".

Change **to** 

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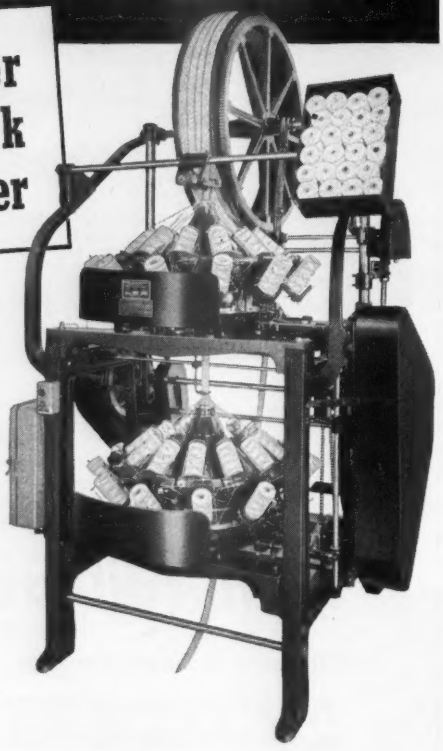

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In the discussion of properties, the book follows closely the recommendations of such organizations as the American Society for Testing Materials, the American Society of Mechanical Engineers, and the American Standards Association.

★ ★ ★

"Titanium in Iron and Steel" contains 294 pages and is priced at $6.00.

Adjustable Container Packing

Signode Steel Strapping Company has published a new folder giving a complete, illustrated description of new method of packing articles or packages of different shapes and sizes. New method uses adjustable fibre board sections telescoped together to form an outer container. Folder shows, step-by-step, how various sizes of modular units can form a compact, quickly assembled container for a variety of packages. Pack is compactly unitized with steel strapping for safe, secure interstate or export shipping. Shows size chart and simple equipment recommended for complete packing operation. It is trade named Adjusta-Pak. The folder will be sent upon request. Address the company at 2600 North Western Ave., Chicago 47, Ill.

ABSTRACTS

GRANULATION DE SURFACE APRES DEFORMATION PLASTIQUE. RELATION AVEC LES CONDITIONS D'ECROUISSAGE ET DE RECUIT. SURFACE GRAIN FORMATION AFTER PLASTIC DEFORMATION. THE INFLUENCE OF COLD-WORKING AND ANNEALING.

J. Herenguel, F. Santini. Rev Metall 1954 Vol 51 (7) pp 482-488 (July) (In French)

Pure aluminium and 3% aluminium-magnesium alloy cold-worked by rolling and wire drawing. Surface structure disappears with increased cold-working at about 400% reduction in thickness or cross-sectional area, but this figure varies slightly with original grain size and method of cold-working. Partial anneals, ie insufficient for complete recrystallization, produce mechanical properties (elastic limits etc) similar to recrystallized state, but retain smooth amorphous surface of cold-worked specimen. Effect of grain size, orientation etc reappears with complete anneal. 7 illustr, 7 ref, 1 table.

H* C 11.0

★ ★ ★

PROCESSING AND DRAWING OF STEEL WIRE

P. A. Beaman (Morgan Constr Co.) Iron & Steel Eng 1954 Vol 31 (10) pp 96-100 (Oct)

Tungsten carbide dies chiefly considered; diamond dies used to limited extent on fine wire sizes. 2 illustr.

Y* **C 11.0**

★ ★ ★

DEFORMATION TEXTURES OF FACE-CENTRED CUBIC METALS

E. A. Calman (NPL). Acta Metall 1954 Vol 2 (6) pp 865-874 (Nov)

Process of wire drawing simulated by tensile stress in direction of drawing together with circular array of compressive stresses perpendicular to this direction. 13 illustr, 19 ref, 2 tables.

Y* **C 11.0**

★ ★ ★

INFLUENCE OF COLD DEFORMATION ON THE YOUNG'S MODULUS OF SOME NON-FERROUS MATERIALS

M. Cook, T. L. Richards, G. F. Bidmead (ICI Ltd). Inst Met Journ Vol 83 (2) pp 41-47 (Oct)

Method of determining modulus values; effect of deformation by cold rolling and drawing; and by extension and compression. 6 illustr, 10 ref, 3 tables.

Y* **C 11.0**

★ ★ ★

DRAWING TEXTURES IN COMMERCIALLY PURE TITANIUM WIRE

I. Gokyu, H. Suzuki, R. Horiuchi. Nippon Kinzoku Gakkai-Si 1954 Vol 18 (4) pp 201-204; Inst Met Journ: Metall Abstr 1954 Vol 22 (3) col 196 (Nov) (Original in Japanese)

Y* **C 11.0**

★ ★ ★

MAGNETIC INVESTIGATIONS OF INTERNAL STRESSES. 1. INTERNAL STRESSES IN THE STRETCHING OF NICKEL WIRE. 2 INTERNAL STRESSES IN DIE-DRAWN NICKEL WIRE

F. Forster, K. Stambke. Zeits Metallkde 1941 Vol 33 pp 98-104; pp 104-114; Nuclear Sci Abstr 1954 Vol 8 (18A) pp 669-670 (Sep 30) (Original in German)

AEC-tr-1938/9. Development of internal stresses in die and their decrease with stretching discussed.

Y* **C 11.0**

★ ★ ★

WHAT DO YOU KNOW ABOUT POWER BRUSHING?

J. H. Heroy jun. Steel Processing 1954 Vol 40 (9) pp 565-568, 592 (Sep); pp 639-643, 660 (Oct)

In wire brushing. fine wire (.002 to 0.008 in.) used. 18 illustr, 1 table.

Y* **C 11.0**

★ ★ ★

PRECISION MEASUREMENT OF WIRE-DRAWING DIES

T. Hisamoto, K. Kakizaki. Hitachi Rev 1954 (6) pp 127-133 (July); Battelle Techn Rev—Abstr 1954 Vol 3 (12) p 816a (Dec) (Original in English)

Form and measurement of dies; measurement of die angle, hole surface

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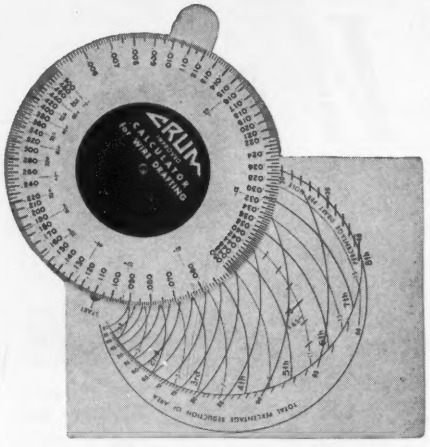

Front view of Crum Calculator.

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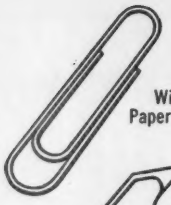
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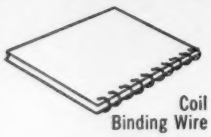
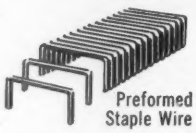

Coil Binding Wire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roughness and die hole circularity; application of circularity measurement method.

Y* **D 11.0 : D 15.0**

★ ★ ★

THE EFFECT OF TENSION ON THE THERMOELECTRIC PROPERTIES OF METALS

A. J. Mortlock. Austral Journ Phys 1953 Vol 6 (4) pp 410-419; Inst Met Journ: Metall Abstr 1954 Vol 22 (2) col 107 (Oct)

Wires of known purity incorporated in the thermocouple and strained at temp of 20 to 400 deg C. Magnitude of general effect appears to depend on purity.

Y* **C 11.0**

★ ★ ★

INTERNAL FRICTION AND DYNAMIC MODULUS OF COLD-WORKED METALS

A. S. Nowick (Yale Univ.) Journ Appl Phys 1954 Vol 25 (9) pp 1129-1134 (Sep)

2 illustr, 33 ref, 1 table.

Y* **C 4.0 : C 11.0**

★ ★ ★

ON THE USE OF NUCLEAR RESEARCH EMULSIONS WITH EMBEDDED WIRES

E. G. Silver, R. W. Waniek (Harvard Univ.) Rev Sci Instr 1954 Vol 25 (11) pp 1119-1123 (Nov)

Molybdenum wire of 28 micron, and nylon and tungsten filaments of 14 micron dia used. 6 illustr, 17 ref.

Y* **C 11.0**

★ ★ ★

STUDY OF HALMAN [CU-MN-AL] ELECTRICAL-RESISTANCE ALLOY. X. ON THE METHOD OF MELTING, FORGING, ROLLING AND COLD WIRE DRAWING. XI. EXPERIMENTS ON SEASON-CRACKING

K. Shinji. Suiyokwai-Shi 1953 Vol 12 (4) pp 181-184; Inst Met Journ: Metall Abstr 1954 Vol 22 (4) col 386 (Dec) (Original in Japanese)

Alloys may be cold drawn into wire after annealing at 500 to 600 deg C. Supposed that internal stresses left in wire after drawing render it liable to season-cracking.

Y* **C 11.0**

★ ★ ★

PATENT

ITAL P 476, 422 (Dec 10, 1952) FIPS Fabricati Italiana Prodotti Sinterizzati SINTERED METAL FILTERS FOR GASES AND VAPOURS

Chem Abstr 1955 Vol 49 (1) col 144 (Jan 10).

Filters fabricated from bronze powder by sintering. Manufacturing process consists of alternately sintering and wire-drawing before forming filter unit.

Y* **C 11.01 : D 7.01**

★ ★ ★

These abstracts are published through the courtesy and with the permission of the Industrial Diamond Research Bureau, 34 Holborn Viaduct, London, E.C.1, England. Inquiries regarding them should be directed to the Bureau.

Outstanding Personalities of the Wire Industry

Litzler Appoints Eastern Sales Representative

The appointment of **H. Leslie Bullock** as District Sales Engineer for **C. A. Litzler Co., Inc.,** effective at once, was announced by **C. A. Litzler,** President.

★ ★ ★

Mr. Bullock will cover the metropolitan New York and New England territory from his headquarters at 136 Liberty Street, New York City. The C. A. Litzler Co., Inc. builds specially engineered coating and impregnating machinery and equipment for such end products as tire cord fabric, artificial leathers, impregnated and coated fabrics and papers, and insulated electrical wire and cable.

★ ★ ★

Mr. Bullock is a Licensed Professional Engineer in the State of New York, attended Columbia University, and has been active in the American Society of Mechanical Engineers, the Society of the Plastics Industry, and the National Panel of Arbitrators of The American Arbitration Association.

H. Leslie Bullock

For the last twenty-two years, Mr. Bullock has been a well-known New York consulting engineer, having dealt in many problems on coating, mixing and continuous processing equipment. He has been a speaker before many National engineering groups, and has authored several important works relative to coating and mixing.

Celanese Names General Sales Manager

Robert H. Kampschulte has been named General Sales Manager, Chemical Division, **Celanese Corporation of America,** it has been announced by **R. W. KixMiller,** General Manager of the Division. Mr. Kampschulte, who joined the Company in 1947 and has been Assistant General Sales Manager since 1952, succeeds John W. Stevens, resigned.

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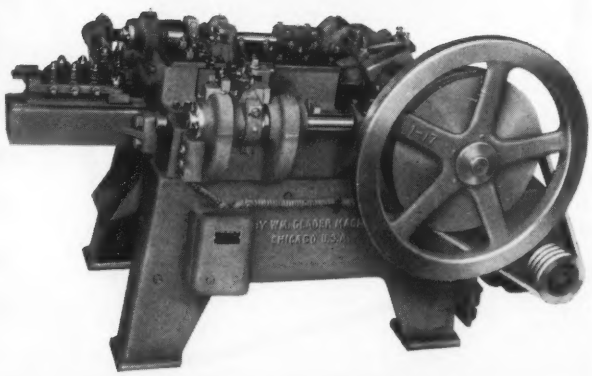

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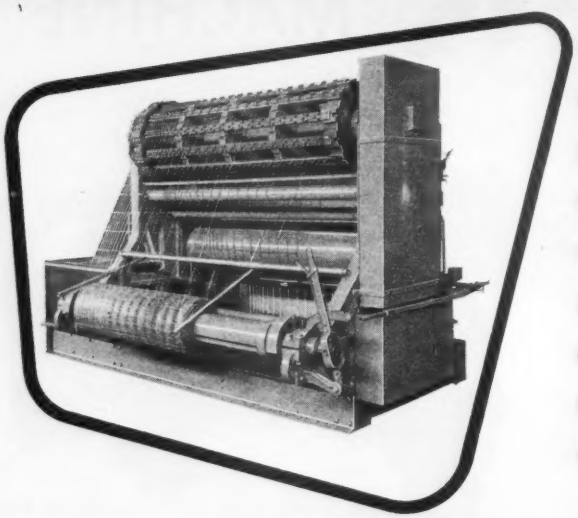

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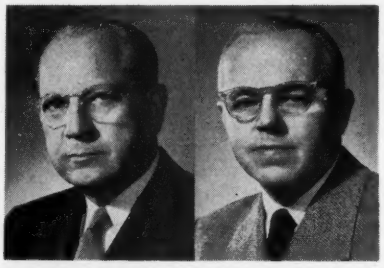
Continental Steel Makes Four Changes in Officers

The annual meeting of shareholders of **Continental Steel Corporation** was held in March at the company's offices in Kokomo, Ind. Shareholders re-elected ten directors for the ensuing term of one year and elected **Edmond P. Severns** as a director to fill the vacancy caused by the recent death of **Rulo S. Conrad.** Those re-elected were **Geoffrey G. Beard** of Pittsburgh, **R. H. Mabbatt** of Chicago, **Charles S. Rauh** and **Carl F. Walk** of Indianapolis, **Loren E. Souers** of Canton, and **Urlin K. Becker, Ralph K. Clifford, John P. Fredrick, D. A. Williams** and **W. G. Harter** of Kokomo.

★ ★ ★

Immediately after the meeting, the directors met and named the following officers of the corporation: Chairman of the Board, **Ralph K. Clifford;** President, **Edmond P. Severens;** Vice President and General Counsel, **Loren E. Souers;** Vice President and Treasurer, **Urlin K. Becker;** Vice President in Charge of Industrial Relations, **Russell A. Chaffin;** Vice President in Charge of Sales, **Howard C. Williams;** Secretary and Assistant Treasurer, **W. G. Harter;** and Assistant Secretary and Controller, **S. C. Land. D. A. Williams** was elected Honorary Chairman of the Board.



(Left) R. K. Clifford, Chairman of the Board. (Right) Edmond P. Severns, President.

★ ★ ★

The executive committee named was: **Edmond P. Severns,** Chairman, **Ralph K. Clifford** and **Urlin K. Becker.**

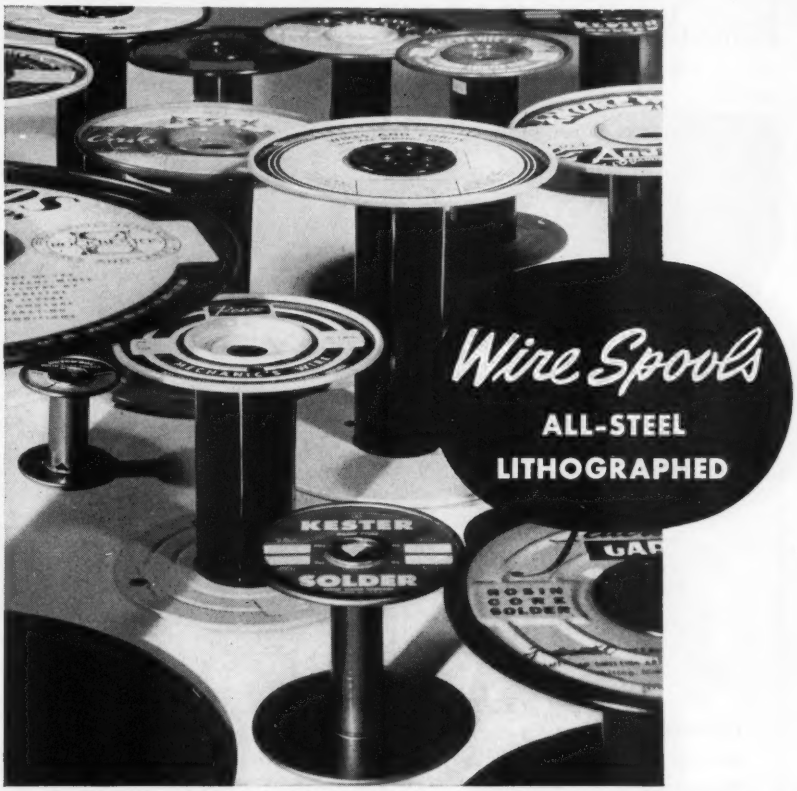
★ ★ ★

The four changes in position of the company's official staff were occasioned by the retirement, after sixty years of continuous service in the steel industry, of **D. A. Williams.** Mr. Williams began his career at Niles, Ohio in 1895, was one of the organizers of The Superior Sheet Steel Company, Canton, Ohio, which in 1927 was united with Chapman Price Steel Company of Indianapolis and the Kokomo Steel and Wire Company to form Continental Steel Corporation. He served as president of Continental from 1931 through 1946, then became Chairman of the Board to the present time and continues as a member of the board of directors.

★ ★ ★

Ralph K. Clifford, the new Chairman, is well known in the steel industry, having served as a member of the board of the American Iron and Steel Institute and as president of **The Wire Association.**

★ ★ ★



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Traverse lengths up to 12″

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LITHOGRAPHED METAL CONTAINERS

J. L. CLARK MANUFACTURING COMPANY • ROCKFORD, ILL.

Edmond P. Severns, now president, was named vice president and general manager of the corporation one year ago after having been vice president in charge of sales since 1939.

★ ★ ★

Howard C. Williams was formerly general manager of sales and has been with the company since 1934.

AS&W Appoints Sales Manager

Charles H. Eisenhardt, Jr., has been named Cleveland District sales manager for **American Steel & Wire,** it has been announced by **John Graham,** general sales manager for this **United States Steel Division.**

★ ★ ★

Born in Baltimore, Md., in 1902, Mr. Eisenhardt graduated from Baltimore City College in 1920. He joined the Wire Division in 1925 and became a salesman in 1930. In Washington in 1942, Mr. Eisenhardt acted as salesman and special representative during the early war years and in 1944 was named assistant electric products sales manager in the general office in Cleveland. He has served as that department's sales man ager since 1950.

★ ★ ★

In his new position he will direct Wire Division sales efforts throughout Northern Ohio. Mr. Eisenhardt succeeds **Norman M. Sted** who was promoted recently to assistant general sales manager.

Appointed Detroit Firth Sterling Manager

Firth Sterling Inc. announces the appointment of **John S. Roller** as Detroit district sales manager. He was formerly assistant to **Thomas G. Barnes,** vice president in charge of sales, and was located in Pittsburgh.

★ ★ ★

Before joining Firth Sterling in 1951 as vice president and general manager of The Method X Company, a Firth Sterling affiliate, Mr. Roller served 17 years with Republic Steel. His initial years with Republic were spent in the Detroit area.

★ ★ ★

In his new capacity Mr. Roller will be responsible for the sale of the Company's tool steels, high temperature alloys, and sintered carbides in the Detroit area, where Firth Sterling has maintained a district office and warehouse for over 30 years.

Sleeper & Hartley Elects Officers

The Annual Meeting of **Sleeper & Hartley, Inc.** was held at the office of the Corporation February 28, 1955.

★ ★ ★

The following Officers were re-elected: **Clayton F. Fisher,** President and General Manager, **William H. Welsh,** Treasurer, **James J. Love,** Assistant Treasurer, and **Stanley G. Barker,** Clerk.

★ ★ ★

Richard S. Russell, a grandson of the late Frank H. Sleeper, founder of the Company, was elected Vice President. He has been with the Company for over six years, working up through the various offices and duties to his present position.

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Only ½ the Weight!

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ACROPAK Spools will help you cut wire packaging costs because they give longer service, require less maintenance and cost less to ship. They're strong. They'll take repeated shippings and still run true on the arbor. They're machined to close tolerances. You can run them at high production speeds with fewer snags, less toe-out and minimum end breakage.

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Best proof of ACROPAK superior performance are the millions of these spools now used by the biggest names in the wire industry. We've proved it to them—let us prove it to YOU.

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ACROMETAL PRODUCTS INC.
Division U S Bobbin and Shuttle Co., 616 Fifth Street N., Minneapolis 1, Minn.

The Directors elected were: Messrs. **Clarence S. Arms, Gardener G. DeMalie, Clayton F. Fisher, George W. Motherwell, Richard S. Russell,** and **William H. Welsh.**

★ ★ ★

The President reported a successful year with excellent prospects for increased production during the coming year.

★ ★ ★

Sleeper & Hartley, Inc., is the oldest Company specializing in the manufacture of Spring Making machinery in the Country. It has a world-wide reputation for the quality and excellence of Spring Coiling equipment and has been for many years a leader in this industry.

Utica Drop Forge Appoints Sales Manager

Utica Drop Forge & Tool Corporation has announced the appointment of **Frank L. Marshall** as Sales Manager of the Tool Division. He will be calling on Utica Distributors extensively, helping with sales problems and analysis.

★ ★ ★

Mr. Marshall was formerly Vice President and General Manager of Mayhew Steel Products, Inc., Shelburne Falls, Mass. He had been with Mayhew since 1939. During World War II Marshall was a Captain in the Army Air Force.

Frank L. Marshall

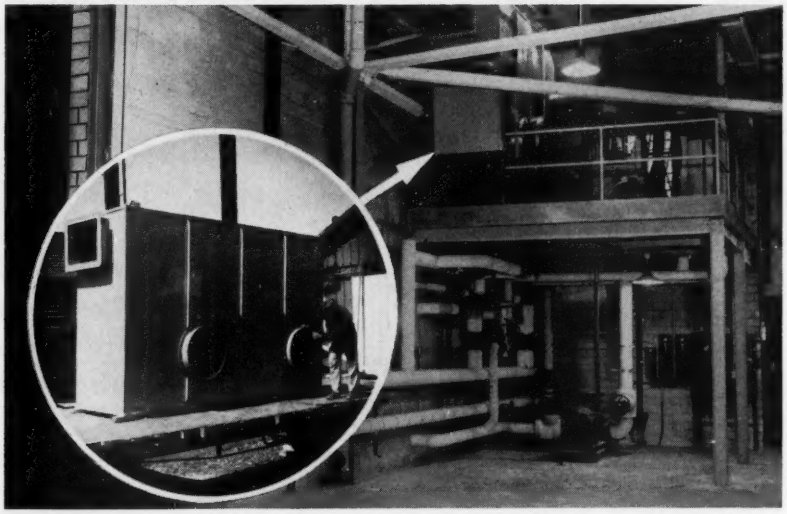
Firth-Loach Appoints Production and Research Managers

Firth-Loach Metals Inc., of McKeesport, Pa., who produce Firlomet — the latest entry into the expanding carbide field—announce the appointment of **Robert C. Lindberg** as Superintendent of Production, and **William C. Seitz** as Manager, Research and Development.

★ ★ ★

Mr. Lindberg, who has been in the carbide field for 20 years, began his career in the Carbide Division of **Firth-Sterling** in 1935. Starting in the mixing department, he was named Foreman in 1936 and was responsible for all powder stocks. As Technician in the Powdered Metal Department in 1942, he gained experience in all phases of production from raw powders to finished sintered products. He rose to Supervisor of Quality Control in 1951, and was named Engineer in charge of development for the Carbide Production Department in 1952. At Firth-Loach, he

FOR CONTROLLING ACID FUMES IN YOUR PICKLING OPERATIONS



Rigidon duct system installed in new wire mill to handle sulfuric pickling fumes. (Engineered by Austin Company, Cleveland, Ohio).

SPECIFY RIGIDON SOLID PLASTICS

- √ **Acid protection inside and out**
- √ **Round or rectangular**
- √ **Easy to install**
- √ **Low initial cost**
- √ **Good chemical resistance**

CHEMICAL-PROOF LININGS-TANKS HEATERS PLASTICS

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Other Heil Products Include:

COATED AND LINED FANS • PICKLING TANKS • NOCORDAL IMPERVIOUS GRAPHITE EXTERNAL HEAT EXCHANGERS • MONEL PICKLE HOOKS • LEAD STEAM JET AGITATORS • ACID PROOF MAINTENANCE MATERIALS FOR EXTERIOR APPLICATIONS • SPECIAL LEAD FABRICATIONS.

is responsible for carbide quality and production, and maintenance of raw materials and powder stocks.

★ ★ ★

Prior to joining Firth-Loach Metals, Mr. Seitz was associated with Firth-Sterling from 1935 to 1954. With 20 years in carbides, he has extensive experience in all phases of production of tungsten, cobalt, nickel and iron powders. As a member of the Research Division in 1938, he specialized in the use of X-rays to determine Crystallographic structures of metals, carbides and alloys, and developed various mixed crystals used in manufacturing processes. Promoted to Supervisor of Carbide Research in 1940, he became Assistant Manager of the Carbide Research Department in 1951, a position he held until joining Firth-Loach.

Veteran Republic Man Retires

After a half-century of service with **Republic Steel Corporation's Union Drawn Steel Division, John B. McClain** has retired. He has been manager of the order and service department since 1926.

★ ★ ★

D. D. Buchanan, manager of operations, praised McClain for "an outstanding job for Union Drawn and Republic Steel." He said, "McClain's vast knowledge of the cold drawn steel business has been an important factor in the success of Union Drawn operations."

★ ★ ★

Mr. McClain, 68, joined Union Drawn in 1905 following his graduation from Duff's Business College in Beaver Falls, Pa. He was a correspondence clerk at Beaver Falls, then Union Drawn headquarters.

★ ★ ★

He became assistant manager of the order and service department in 1919 and was named manager of the department in 1926. He came to Massillon when Union Drawn moved its headquarters here in 1932.

Oliver Iron and Steel Elects New President

Paul H. Startzman, executive vice president, has been made president of the **Oliver Iron & Steel Corp.,** Pittsburgh. At the same time **Thomas E. Boyd** was elected controller and assistant secretary.

National Electric Products Elects Chairman and President

Directors of **National Electric Products Corporation,** Pittsburgh, have elected the firm's founder, **W. C. Robinson,** Honorary Chairman of the Board. The action was taken at the last director's meeting.

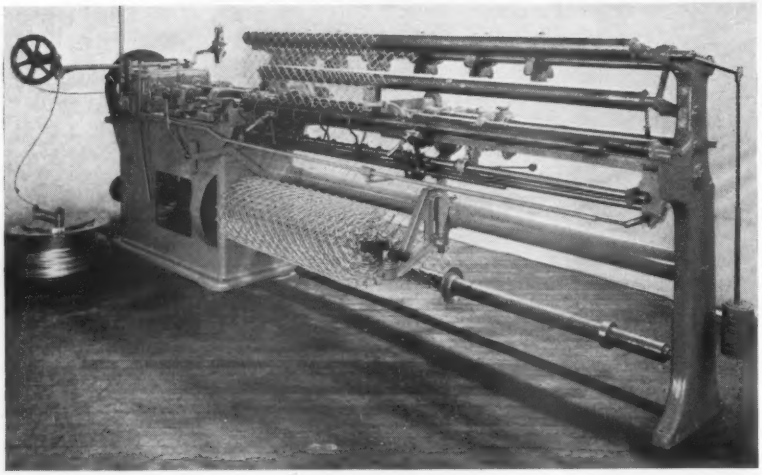
★ ★ ★

At the same time, the directors elected **A. L. Robinson,** Chairman of the Board and **W. C. Robinson, Jr.,** to succeed his father as President.

★ ★ ★

The senior Mr. Robinson is a pioneer in the electrical construction field. When he founded the company 50 years ago the entire electrical industry was in its infancy.

INVINCIBLE CHAIN-LINK FENCE MACHINE



Completely Modern in Design, Far less power and floor space, 50% more production, Saves 1/2" wire per mesh, Will pay off in a year, "Invincible" our latest model is Proven by 16 months operation and the users want more.

ARTHUR BLASHILL & COMPANY

TEMPORARY OFFICE
78 DOWNING STREET
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In the half century since Mr. Robinson founded the firm, it has experienced impressive growth both in corporate size and product diversification. Today, it is the largest U. S. manufacturer of electrical wiring systems. The main plant is in Ambridge, Pa., with other plants in Torrance, Cal., and Elizabeth, N. J.

★ ★ ★

Other action taken by the Board of Directors included election of A. L. Robinson, Jr., as a Director and Secretary of the corporation. F. J. Kennedy, Vice President in Charge of Engineering, was given the additional title, Assistant to the President. Other officers and directors are **G. L. Wanamaker,** Vice President, Production; **R. C. Bennett, Jr.,** Vice President, Sales; **J. Sterling Davis,** Treasurer, and **J. W. Schuck,** Assistant Treasurer.

★ ★ ★

James M. Houston, attorney with the firm of Rose, Rose & Houston, was elected a new Director of the company.

Pacific Coast Borax Announces Staff Changes

Pacific Coast Borax Co., Division of **Borax Consolidated, Limited,** has announced the following personnel changes:

★ ★ ★

L. L. Fusby has been appointed Production Manager, with headquarters in the Los Angeles office. He is a graduate in Chemical Engineering from the University of California. He has been in various positions with the Company and most recently was General Superintendent at Boron, 1951-1955. He will have over-all charge of the production facilities at Boron, and Wilmington, California.

★ ★ ★

W. J. Diffley has been appointed Superintendent of the Boron operations. Mr Diffley is a Chemical Engineer, having graduated from New Mexico State College in 1934. He has been a Chemical Engineer with the Company, and Production Manager at the Wilmington plant for the past seven years.

Dr. D. S. Taylor has been appointed Director of Industrial Research, responsible to the Vice President in Charge of Research, **George A. Connell.** Dr. Taylor will have charge of coordinating all of the industrial research projects in the Company. A graduate in chemistry from the California Institute of Technology, Dr. Taylor has been a Research Chemist and Research Engineer with the Company for the past ten years.

★ ★ ★

The Company announced that these changes have been made because of the gradually expanded research and production activities in which it is engaging.

Timberlake Elected Director Of J & L

John E. Timberlake has been elected a member of the board of directors of the **Jones & Laughlin Steel Corp.,** Pittsburgh, Pa., succeeding **Adam J. Hazlett,** who has retired. Mr. Hazlett will continue as consultant to the president. Mr. Timberlake is a member of The Wire Association.

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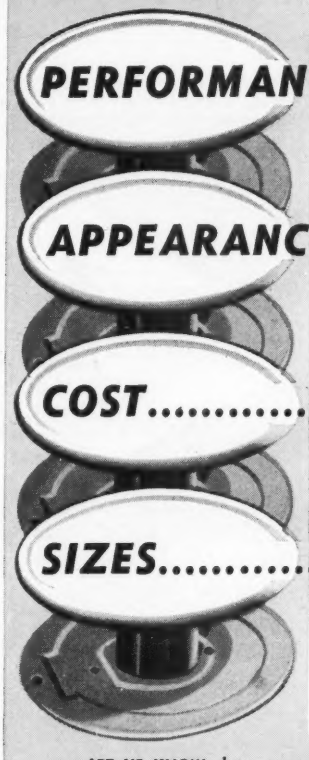

PERFORMANCE... Dependability that makes Mason Spools the choice of 175 manufacturers!

APPEARANCE..... Rich, colorful Mason lithography assures *instant brand recognition!*

COST..... Mason Spools have won the title "Best for *Less!*"

SIZES..... Mason lightweight, non-returnable spools are available in 5″, 6½″, 8½″ and 10½″ head sizes. All sizes are available with 1⅞″ (Dia.) barrels. The 10½″ head size is also available with a 3½″ (Dia.) barrel. Barrel lengths from ⅝″ to 14″.

LET US KNOW about your spool requirements *now!* Telephone East Providence 1-2810 or write to:

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1949 Dexter Road, E. Providence 14, R. I.
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Changes at ACCO's Rope Division Occasioned by Retirement of Gregson

George C. Gregson retired on April 1st as head of the Hazard Wire Rope division of **American Chain & Cable Company,** Wilkes-Barre, Pa., and as manager of the company's wire-rope plant at Houston, Tex. He has been chief executive at the local plant for more than a quarter century.

★ ★ ★

Mr. Gregson will be succeeded in his position as works manager at both the Hazard and Houston plants by **Ernest S. Wellhofer.** Mr. Wellhofer was appointed assistant works manager at the Hazard plant three months ago. Prior to that he was the chief rope engineer.

★ ★ ★

Charles H. Layton has succeeded Mr. Wellhofer as chief wire rope engineer at Hazard. He has been serving as assistant chief engineer.

★ ★ ★

Born in Barrow-in-Furness, Northwest Lancashire, England, 70 years ago last December 16th, Mr. Gregson has been engaged in manufacturing work for more than a half century.

★ ★ ★

In 1925 he joined the then **American Cable Company** and made a three-month survey of conditions at its two rope mill plants in New Jersey. He was retained as works manager to put into effect his recommendation.

★ ★ ★

When American Cable Company, later the American Chain & Cable Company, took over the **Hazard Rope Works** plant in Wilkes-Barre, Mr. Gregson was sent there to take charge.

★ ★ ★

In 1939 he supervised the construction of a wire rope plant at Houston, Tex.

THE NEW LOOK

IN DIAMOND DIES

This is what you have been waiting for!
It is the answer to lower production costs.

GET THE UTMOST LIFE AND SERVICE FROM YOUR DIAMOND DRAWING DIES.

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THE "NATDI"

The "NATDI" is a reversible Diamond Die.

We waited months for full proof, so that you could be sure of the new die's performance. Customer's report:

1. **UP TO 100% MORE PRODUCTION AT THE INITIAL SIZE.**
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Appoints Sales Representatives And Service Engineer

In keeping with its policy of continued expansion of sales and field engineering service in key marketing areas, **Firth Sterling, Inc.** has announced the appointment of three sales representatives and one carbide service engineer in the firm's Detroit, Chicago, Pittsburgh and Dayton Districts respectively. They are **J. B. Wilson, J. D. Doherty, J. J. Barry** and **W. B. Withers** who have been given training orientation courses at the general offices in Pittsburgh.

★ ★ ★

Mr. Wilson studied physical metallography at the General Motors Institute of Technology at Flint and was later employed there as a metallographer. Before joining Firth Sterling Mr. Wilson was a lab engineer for Ford Motor Company.

★ ★ ★

Mr. Doherty studied industrial engineering at the Illinois Institute of Technology. Three years ago he joined Firth Sterling at its Chicago District office and has returned to that city.

★ ★ ★

Mr. Barry studied chemical engineering at Allegheny College. Before joining Firth Sterling he

worked for the R. C. Coxhead Corp. He is located in Firth Sterling's Pittsburgh District.

★ ★ ★

Mr. Withers became associated with Firth Sterling after twenty years experience in the machine shop field. As a carbide service engineer he will represent the firm in the Cincinnati-Dayton area.

ASQC Convention To Hear Thompson

Harry E. Thompson, Director of Research for **Anaconda Wire & Cable Co.,** Hastings-on-Hudson, N. Y., will participate in a panel discussion on "Reaching the Worker and Industrial Communication", a feature of the Ninth Annual Convention of the **American Society for Quality Control,** to be held on May 23-25 in New York City.

★ ★ ★

Among other members of the panel will be **William P. Goepfert** of the **Aluminum Company** of **America.**

Pittsburgh Screw and Bolt Elects New President

Effective May 1st, **D. D. Greenshields** became president of **Pittsburgh Screw & Bolt Corp.,** Pittsburgh. He had been with **National Screw & Mfg. Co.** in Cleveland for 20 years and has resigned from there as executive vice president and director to join the Pittsburgh firm. **J. M. Yahres,** formerly president and chairman of the board of Pittsburgh Screw & Bolt, will continue to serve as chairman.

Volco Brass Promotes Two Executives

Frank W. Lavache, executive vice president of **Volco Brass & Copper Co.,** Kenilworth, N. J., has announced the promotions of **Arthur W. Cain** to vice president in charge of sales and **Arthur C. Culbertson** to treasurer.

★ ★ ★

Mr. Cain was elevated to his new post from the position of Volco's eastern regional sales manager. He joined Volco in 1948 as Philadelphia district sales manager. A graduate of the Wharton School, at the University of Pennsylvania, Mr. Cain served four years of World War II with the First Marine Air Wing in the South Pacific.

★ ★ ★

Mr. Culbertson was formerly assistant treasurer at Volco. He began his career there in 1948 as head accountant.

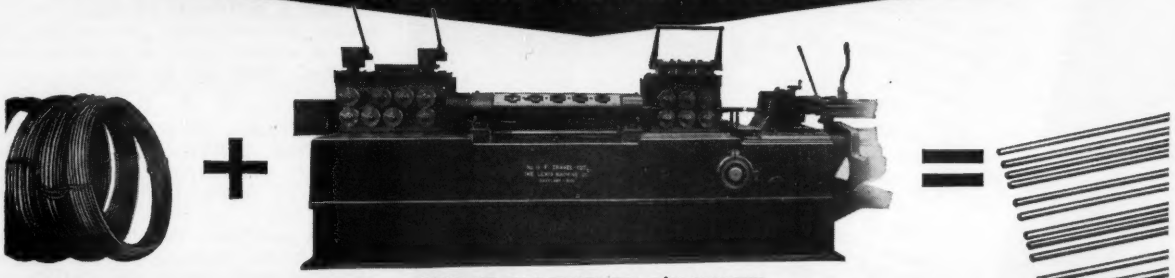
G.E. Appoints Silicone Marketing Manager

The appointment of **Theodore C. Ohart** as Manager — Marketing of **General Electric Company's** Silicone Products Department was announced by **Dr. Charles E. Reed,** general manager of the department.

★ ★ ★

Mr. Ohart, a native of Utica, N. Y., was graduated from Cornell University with a B. S. in Mechanical Engineering. He joined General Electric in 1929.

SLASH WIRE AND BAR STOCK INVENTORY COSTS with this combination



LEWIS NO. 11-F TRAVEL-CUT, 3/4" CAPACITY

No need to build up big stocks of hundreds of different wire or bar stock lengths when you use LEWIS machines in your plant. LEWIS machines handle practically all materials and shapes from .012" to ¾" . . . quickly and economically produce the length of wire or bar stock you need . . . when you need it, as you need it. For more than 48 years, sturdy, dependable LEWIS machines have made possible substantial savings for leading manufacturers in the metal-working industry.

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A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50¢ for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,702,919, CARPET SECURING DEVICE, patented March 1, 1955 by Robert A. Judge, New York, N. Y.

This is a carpet securing and nailing device made up of spaces apart longitudinal and transverse metal rods forming a lattice and having carpet engaging and stretching points at the longitudinal edges of the lattice formed by the terminals of the rods.

★ ★ ★

No. 2,703,026, APPARATUS FOR STRIPPING INSULATION FROM WIRE, patented March 1, 1955 by Carmen L. Basile and Pankracy Terry, Chicago, Ill., assignors, by direct and mesne assignments, to Taylor Spring and Manufacturing Company, Chicago, Ill., a corporation of Illinois.

Included is a rotatable and axially movable tubular cutting tool for movement of insulated wire therethrough and provided with a number of radially inwardly extending cutting elements which may be moved inwardly into cutting engagement with the insulation.

★ ★ ★

No. 2,703,183, APPARATUS FOR HANDLING METAL COILS, patented March 1, 1955 by John W. McMahon and Le Roy Blank, Warren, Calvin H. Windle, Cortland, and David E. Poole, Warren, Ohio, assignors to Republic Steel Corporation, Cleveland, Ohio, a corporation of New Jersey.

The apparatus includes a ramp having one stationary side guide wall and one laterally movable side guide wall, a pair of coil buggies adjacent one end of the ramp, one of the buggies having a bridge portion cooperating with the ramp to define an elongated inclined coil travel course, and adjustable coil guide bars adjacent and extending lengthwise of the buggies and having end portions adjacent one of side guide walls to engage and support coils carried by the buggies prior to their delivery onto the ramp by the buggies.

★ ★ ★

No. 2,703,207, VARIABLE RESISTOR WINDING MACHINE, patented March 1, 1955 by John R. Moore, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.

A potentiometer winding machine is disclosed, comprising a master potentiometer support, a device for winding turns of wire on a turn supporting members, and a device responsive to a change in the ratio of the resistance of the turns wound on the supporting member and the resistance of the turns occupying a corresponding space on the master potentiometer for varying the lead of winding turns on the supporting member. There are 23 claims.

★ ★ ★

No. 2,703,234, MEAN FOR RESTORING THE STRENGTH TO WEAKENED COIL SPRINGS, patented March 1, 1955 by Damon L. Tapp, Plymouth, Ind.

More specifically the one claim in the patent is for restoring the strength to weakened knee action coil springs.

★ ★ ★

No. 2,703,414, SPRING CUSHIONING DEVICE AND REINFORCEMENT FOR THE BORDERS THEREOF, patented March 8, 1955 by Albert M. Bank, Jersey City, N. J.

For employment with a spring cushioning unit having a border and comprising a number of rows of coil compression foundation springs, the inventor provides a device to reinforce the border of the unit comprising a spring made from a single piece of spring wire, and comprising top and bottom loops interconnected by crossing inclined wire portions, and means for attaching the top loops to the top of the unit and the bottom loops to the bottom of the unit.

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Plymouth offers you PLYMKRAFT improved cable filler to your precise specifications. Made to fine tolerance, always uniform, this improved type of twisted paper is available in the exact put up that works best on your equipment, with any type treatment applied —wax, jute saturant, anthracene. Keep up to date on cable filler developments. For samples of PLYMKRAFT write to Plymouth, makers of fine cordage products for over 130 years.
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Plymouth Cordage Company
Plymouth, Massachusetts
New Orleans, Louisiana
Warwick, Virginia
PLYMOUTH
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No. 2,703,512, WIRE SHAVING APPARATUS, patented March 8, 1955 by Albert H. Brookes, Golden, Colo., and Leonard J. Rieger and Leroy L. Martin, Baltimore, Md., assignors to Armco Steel Corporation, a corporation of Ohio.

A shaving head for simultaneously and mechanically finishing, in a once-through pass, all faces of metal stock of hexagonal section is provided, comprising six support rods extending longitudinally of the shaving head and disposed in regular hexagonal pattern when viewed in section; and a like number of like cutter tools carried along the length of these rods and each carrying a cutter blade of smooth, unbroken and continuous cutting edge, there being one such cutting tool for each face of the metal stock, the cutter tools being paired, so that those tools which are three removed from each other along the rails are applied against opposite faces of the metal stock.

★ ★ ★

No. 2,703,550, APPARATUS FOR DESCALING AND COATING WIRE, patented March 8, 1955 by George W. Bell, Sterling, Ill., assignor to Northwestern Steel and Wire Company, Sterling, Ill., a corporation of Illinois.

A descaling assembly comprising a rotary drum, divided into a number of chambers including a tumbling chamber is disclosed, a lime applicator chamber, and a lubricant applicator chamber, a device for passing an article to be descaled successively through the tumbling chamber, the lime applicator chamber, and the lubricant applying chamber, a number of hard metallic balls in the tumbling chamber for abrading the article upon rotation of the drum, and agitator elements in the lubricant applying chamber for agitating lubricant disposed in this chamber.

★ ★ ★

No. 2,703,592, MACHINE FOR LOOPING COIL SPRINGS, patented March 8, 1955 by Chester F. Penny, Bridgeport, Conn., assignor to Underwood Corporation, New York, N. Y., a corporation of Delaware.

There are eleven claims in this patent which is more specifically to a spring feeding and positioning mechanism including a series of operating discs mounted upon a common shaft.

★ ★ ★

No. 2,703,644, PARALLEL WIRE BELTING, patented March 8, 1955 by Carmen J. Van Lake, Waukegan, Ill., assignor to United States Steel Corporation, a corporation of New Jersey.

The belting which embodies spaced apart wire members and twisted wire edging, is provided with spacer clips to connect the wire members to form a continuous line of reinforcing.

★ ★ ★

No. 2,704,103, METHOD OF AND APPARATUS FOR MANUFACTURING CORELESS BANKED MULTILAYER COILS, patented March 15, 1955 by Otto Wirth, Zurich, Switzerland, assignor to Micafil A.-G., Zurich-Alstetten, Switzerland.

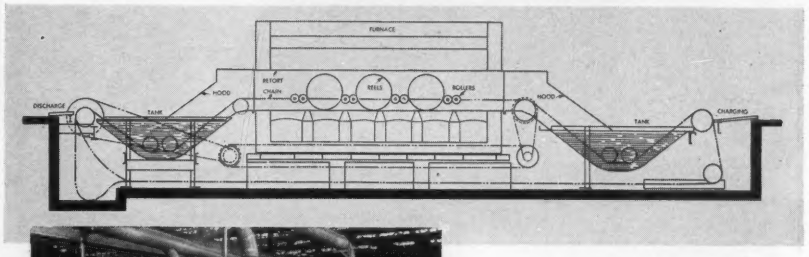
In the manufacture of a banked multilayer coil of fine wire, the inventor provides the process which comprises providing a mandrel of circular cross-section consisting of two mandrel rods of semicircular cross-section, producing relative rotation and relative longitudinal movement of the mandrel and a wire to wind the wire upon the mandrel as a banked multilayer winding, progressively spreading the mandrel rods apart at the winding point as it is displaced along the mandrel, thereby to enlarge the normal diameter of the mandrel, whereby the coil is relatively loose on the mandrel at the end of the winding operation, and withdrawing the mandrel rods one at a time from the wound coil.

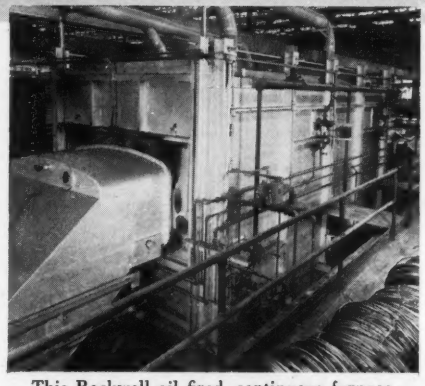
★ ★ ★

No. 2,404,151, WIRE DRAWING MACHINE, patented March 15, 1955 by John A. Holbrook, Worcester, Mass., assignor to Morgan Construction Company, Worcester, Mass., a corporation of Massachusetts.

This machine includes a body of liquid lubricant in a tank, a series of dies submerged in the lubricant, a final die located above the level of the lubricant, two upright drums rotatable within the lubricant for pulling the wire successively through the submerged dies, one of the drums extending above the level of the lubricant to provide a dry portion about which the wire is wrapped to pull it through the final die, and stationary means forming a passage with an upper outlet opening in position to discharge a continuous stream of lubricant on the inlet side of the final die, the passage having a lower inlet open-

Bright Anneals Copper Wire at Lowest Cost





This Rockwell oil fired, continuous furnace anneals copper wire on drums at the rate of 120,000 lbs. per 24 hrs. Drums travel 4 abreast. The work is carried through the exit hood, in foreground, into a steel water tank for quenching, without exposure.

The "wet" method of annealing copper wire (to be subsequently rubber covered), is a Rockwell development that has proved very efficient in operational simplicity, production quality, and labor and space saving.

Drums of coiled wire move continuously, from the wash or other process through a wet or dry seal, then through the alloy retort of the furnace, exit hood, water quench and discharge.

The reels or drums of wire travel several abreast, being rolled along the tanks and retort floor by pipe rollers attached to the alloy link chain conveyor. Length of processing system depends on production needs.

The furnace may be gas or oil fired, or electric. Annealing atmosphere may be provided to assure desired brightness of metal.

It will pay you to learn more about this and other types of Rockwell wire heating equipment. Get Bulletin 432.

ROCKWELL ALSO BUILDS

Batch and continuous furnaces and ovens for annealing, aging, drying, enameling, tinning, glass coating, synthetic coating. Atmosphere generators.

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Sales Representatives in Principal Cities

ing submerged in the lubricant and in position to receive the impact of the whirling current of lubricant produced by the rotation of one of the drums.

★ ★ ★

No. 2,704,174, DROP CATCHING DEVICE FOR POURING LIQUIDS, patented March 15, 1955 by Oskar Uxa, Vienna, Austria, assignor to Eduard Haas, Muhlbach, Attersee, Austria.

The device is constructed of a single length of wire wound into a somewhat funnel-like form.

★ ★ ★

No. 2,704,597, WIRE DRAWING MACHINES, patented March 22, 1955 by Jean Alfred Louis Rozieres, Paris, France.

A process of counter-traction wire drawing is disclosed, comprising drawing a wire through a number of drawing stages in series, and maintaining the traction on the wire at a constant value by employing variations in the traction on the wire to effect changes in the forces acting on the wire to return the traction to the predetermined constant value.

★ ★ ★

No. 2,704,601, ELECTRICAL TESTING APPARATUS, patented March 22, 1955 by Harold J. Vennes, Townson, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

More specifically, this device is for testing the continuity of insulated electric wire. There are nine claims.

★ ★ ★

No. 2,704,612, APPARATUS FOR LIFTING A BUNDLE OF RODS, patented March 22, 1955 by John M. Johnston, Paxton, Mass., and Marhall T. Magee Jr., Macedonia, Ohio, assignors to United States Steel Corporation, a corporation of New Jersey.

The apparatus is adapted for lifting a bundle of rods or the like from a conveyor having a flat surface and moving hooks for pulling bundles over the flat surface.

★ ★ ★

No. 2,704,744, WIRE DRAWING COMPOSITION, patented March 22, 1955 by Georges Laurent Hugel and Moise Lerer, Paris, and Robert Joseph Marie Courtel, Saint-Germain-en-Laye, France, assignors to Institut Francais du Petrole des Carburants et Lubrifiants, Paris, France.

A paste is provided composed of 44 parts of talc powder, 54 parts of 800 M. W. polyethylene glycol and 2 parts of p-dimethoxy-diphenyl-trichlorethane.

★ ★ ★

Reissue No. 23,970, COIL WINDING APPARATUS, patented March 29, 1955 by James G. Everhart, Zanesville, Ohio, assignor to McGraw Electric Company, Milwaukee, Wis., a corporation of Delaware.

This is an electric coil winding apparatus and comprises anti-friction means supported directly on a leg of a closed magnetic core for revolubly supporting the tube about its longitudinal axis, synchronized drive rollers directly engaging the lateral edges at opposite ends of the tube in axial compressive relationship, and a device for rotating the rollers. There are eleven claims.

New Sales Executive for AS&W

Norman M. Sted has been appointed assistant general manager of sales for U. S. Steel Corp.'s **American Steel & Wire Division,** Cleveland, Ohio. He joined the division 29 years ago. Since 1953 he has headed the Cleveland district sales organization as manager.

★ ★ ★

Mr. Suter has been associated with Wyandotte Chemicals Corporation, Wyandotte, Michigan for the past 13 years, where he was Director of Application Research. Prior thereto, he was Assistant Professor of Chemistry, Detroit Institute of Technology.

Elected to Vice Presidency by Chase

Glenn P. Bakken has been elected executive vice president and a director of **Chase Brass & Copper Co., Inc.,** Waterbury, Conn., a subsidiary of Kennecott Copper Corp. He was formerly plant manager at Phoenix, Ariz, for Reynolds Metals Co.

all sizes and constructions of high quality copper and bronze wire

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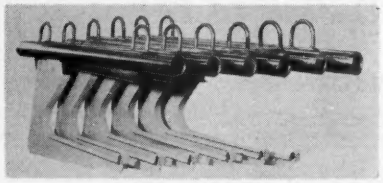
Announces New Line of Acid-Resistant Pickling Hooks

The Lewis Welding & Engineering Corp., 71 Interstate St., Bedford, Ohio, announces the availability of a new line of acid-resistant Monel hooks for use in pickling operations. Of all-welded construction, these hairpin-type hooks feature a specially-designed drip trough on the load bar that picks up condensate and carries it out beyond the rod bundles, a feature particularly important during progressive cleaning operations.

★ ★ ★

To meet a wide range of requirements, Lewis Monel pickling hooks are available in two types and six standard sizes. Hooks of "I"-section construction are supplied for applications involving maximum load capacities up to 3000 pounds.



Lewis Monel Pickling Hooks. * * *

For heavier duty uses, hooks of box-section construction are furnished. These hooks will support up to 4000 pounds. Length of load-supporting section ranges from 4 to 8 feet, depending upon size and construction of hook. All Lewis Monel hooks are bolted to steel spreader bars which can be replaced quickly and economically whenever necessary.

★ ★ ★

For extremely corrosive pickling operations, Lewis can supply special one-piece all-welded hooks and spreader bars of all Monel construction.

★ ★ ★

Full details, specifications and prices will be supplied upon receipt of publication inquiry or letterhead request.

Offers New Bulletin on Automatic Nut Formers

The Waterbury Farrel Foundry and Machine Co., Waterbury, Conn., offers an eight-page, two-color bulletin covering its newly designed line of automatic Nut Formers. These are multiple-die, single-stroke transfer headers especially equipped to produce automatically a cold forged, finished nut blank with every stroke of the heading ram or gate. Rates range from 60 to 125 blanks per minute. The bulletin explains how single and double chamfered, washer face, and castellated nut blanks, as well as special locknuts, pipe plugs and similar metal parts can be produced from cold drawn wire or rod, requiring no subsequent finishing except to cut threads. Production samples and a typical operation sequence are shown. Illustrated with photographs and design details, the bulletin explains major features of the machine.

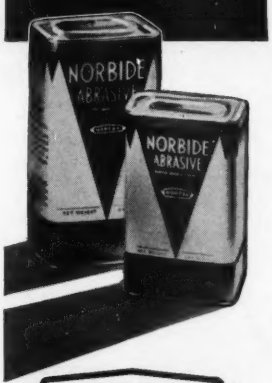
★ ★ ★

Specification data is given for 5 sizes of machines designed to produce nuts for ¼, ⅜, ½, ⅝, and

Refinishing Wire Drawing Dies?

Save Money with NORBIDE® Abrasive . . .

Second in hardness only to diamond which costs a hundred times more



Johnson Steel & Wire Co., Inc. has substantially reduced the cost of refinishing their wire drawing dies by substituting NORBIDE Abrasive for costly diamond dust. Excellent for ripping or for fast stock removal as well as for accurate semi-finishing operations.

High accuracy is important to Johnson for Johnson "music" spring wire is drawn in 200 different sizes, all the way from .003" to .200".

If you are still using diamond dust for your ripping and semi-finishing operations, you'll be amazed at the savings you can obtain by switching to NORBIDE Abrasive.

For cost-cutting abrasive details, write for Form 559.

NORTON COMPANY

45 New Bond Street • Worcester 6, Massachusetts

NORTON

BORON CARBIDE

NORBIDE® . . . the hardest man-made abrasive

FOR – FINE – TINNED – WIRE

IT'S . . .

"UTICA"—ALWAYS

COPPER WIRE . . .

• TINNED —

• BUNCHED —

• STRANDED —

• BOBBINS

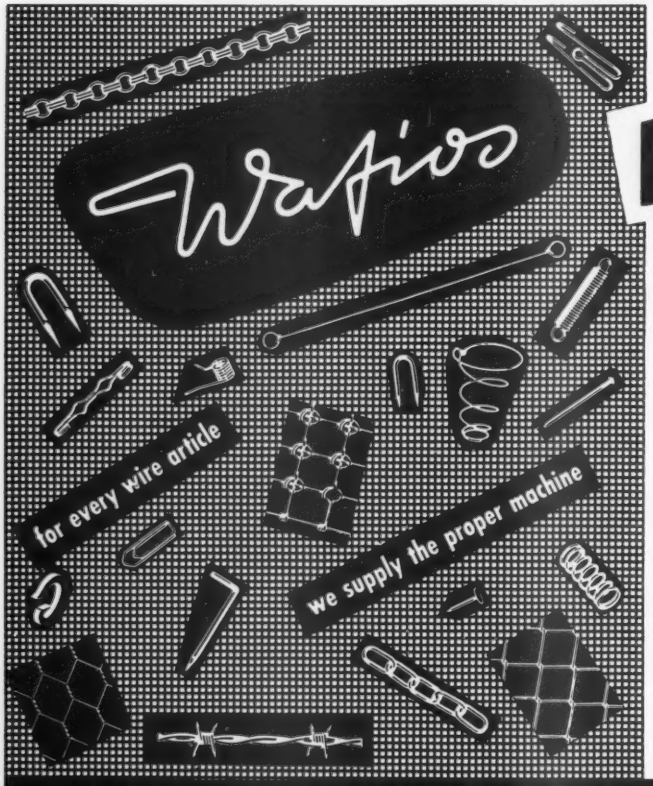
MADE TO EXACTING SPECIFICATIONS.

Our modern facilities are at your disposal and we invite your business.

UTICA WIRE CORPORATION

DERBY, CONNECTICUT

We specialize in **QUALITY** and **SERVICE**



AUTOMATICS

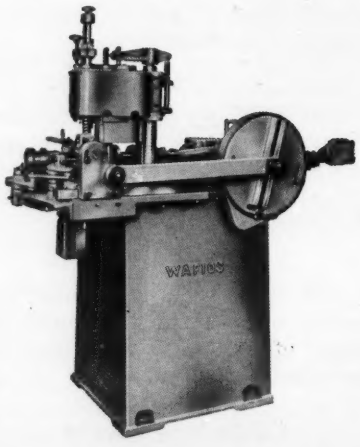
FOR THE WIRE TRADE

SPRING AUTOMATIC TORSION COILING MACHINE

Model SFM, 4 different sizes

Wire Range: .008—.315"

Sole Agents:
Kurt Orban Co., Inc.
34 Exchange Place,
Jersey City 2, N. J.



WAFIOS MASCHINENFABRIK REUTLINGEN 3 / GERMANY

¾-inch bolts. Additional specification data in tabular form includes maximum capacity of each machine, motor hp, motor rpm, machine weight, floor space requirements, and overall height.

★ ★ ★

Concluding the bulletin is a list of additional metal-working equipment supplied by Waterbury Farrel, including cold heading equipment, mill machinery, wire mill equipment and power press equipment.

★ ★ ★

For copies of this new bulletin write to the Waterbury Farrel Foundry and Machine Co., Waterbury 20, Conn. Ask for bulletin 930-A-2.

Wire Inspection Device Shares Honors as Telephone Cable Spans Atlantic

An electronic micrometer, appropriately dubbed the "Diamatrol" and manufactured by **Standard Electronics Research Corporation,** 2 East End Avenue, New York 21, N. Y., is an instrument for inspection and control of wire diameters.

★ ★ ★

While the instrument has many applications for wire and cable manufacturers, in which it enables the mill to control quality and reduce scrap, man-hours and costs, it is also being used on some of the more spectacular jobs, like the $35,000,000. telephone cable that will span 2,000 miles of the Atlantic Ocean, or the 800 mile, $14,000,000 installation running from Washington to Alaska.

★ ★ ★

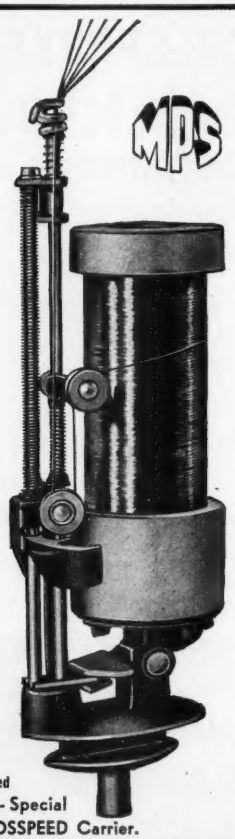
The coaxial cable for these installations was made possible with the development, by Bell Laboratories, of special submarine cable construction techniques, and vacuum tubes designed to have a life expectancy of 20 years for use in the underwater repeaters, without which the voice signals would be too weak to traverse these distances.

★ ★ ★

In the actual manufacture of these multiple message carriers, by prominent firms on both sides of the Atlantic, and according to the techniques as laid down by the American Telephone and Telegraph Company, the Diamatrol is playing a major role in the control of quality, because in such long installations, accuracy in the cable construction is a matter of critical importance.

★ ★ ★

This remarkable device is being made use of in many wire mills for in-process measurement of bare or insulated electric wire diameters. It features no-drift circuits and is automatic in operation, being used right in the production line. Out-of-true wire or cable can be instantly detected and observed visually or recorded on a suitable chart, while the automatic control



Patented
2 BX - Special
MOSSPEED Carrier.

MOSSPEED BRAIDER CARRIERS

FOR BRAIDING

MULTIPLE ENDS OF FINE WIRES

A special design MOSSPEED CARRIER and BOBBIN is supplied for braiding "SHIELDED" WIRE, ETC.

Will braid multiple ends of aluminum, brass, bronze or copper wire, etc.

TWO SHEAVE-WHEELS and SPECIAL-TOP-THREADEYE on carrier, together with new type BOBBIN provides an even wire "let-off" resulting in a high quality and uniform braided shield.

Consult our engineers regarding your braiding problems.

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ATTLEBORO, MASSACHUSETTS, U.S.A.

Telephone
ATTLEBORO 1-0848

European Agent
James Day (Machinery), Ltd., 28 Maddox Street, London, W. I., England.

100

feature can be seen to bring the diameter back to its nominal value.

★ ★ ★

Full information on the Diamatrol, with expert counsel as to its practicability in any wire mill where exacting tolerances must be observed, may be secured from the company by writing or telephoning.

Split-Gauge Wall Chart Available

A unique split-gauge wall-size (21″ x 36″) wire chart is announced by **Mettler Machine Tool, Inc.,** manufacturers of Shuster wire straightening and cut-off machines. The chart is a handy reference for split-gauges in decimal sizes. Copies will be supplied without charge to wire users by Mettler Machine Tool, Inc., Adeline Street, New Haven, Connecticut.

Davis Standard Licenses English Firm

Davis-Standard Sales Corporation, Mystic, Connecticut, announces that license to manufacture and market their electrical wire insulating machinery in Europe and the Sterling Area has been granted to **Finney Presses Limited,** Birmingham, England. This announcement was made by **Benjamin Davis,** Director of Sales for Davis-Standard. **J. Trevor-Jones,** Managing Director of Finney Presses has just returned to England after a trip to Mystic to complete the arrangements.

★ ★ ★

Finney Presses has been representing Davis-Standard as a sales agent for some time, and will continue in this capacity until completion of the tooling that will enable them to begin production.

★ ★ ★

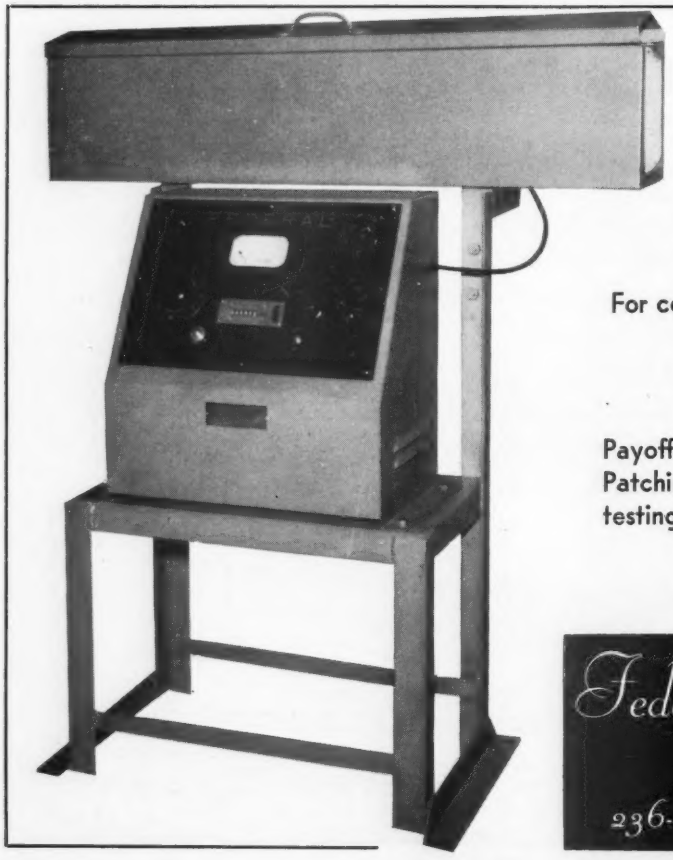
One of the oldest names in plastics, Finney Presses is part of one of Britain's largest world-wide industrial organizations. Mr. Trevor-Jones is Chairman of the Plant and Machinery Division of the **British Plastics Federation,** is a director of several companies operating in the plastics, hydraulics, rubber, sugar, and heavy industry fields in Great Britain, and has a wide knowledge of markets in the Sterling Area and on the continent of Europe.

CF&I Improving Buffalo Plant

An improvement program totaling several million dollars for the **Wickwire Spencer Division** plant in Buffalo of **The Colorado Fuel and Iron Corporation** has been announced by **A. F. Franz,** president of the Corporation.

★ ★ ★

Under this program, Buffalo's



FEDERAL CV SPARKER

USED BY MOST ELECTRIC WIRE COMPANIES

MODEL CV 15 (15,000 VOLTS)
MODEL CV 30 (30,000 VOLTS)

For continuous operation on Extruders & Twisters.
Supplied with or without stand.
Electrode size optional.

OTHER FEDERAL EQUIPMENT

Payoffs • Takeups • Capstans • Re-Spoolers • Patching Molds • Measuring Machines • Full line of testing equipment for insulated & enameled wires.

Send for full details.
Export Sales Office
1505 Race St., Philadelphia, Pa.

Federal Manufacturing Co.
SPECIAL WIRE MACHINERY
236-240 Hall Avenue, Wallingford, Conn.

open hearth furnaces will be made larger and more efficient, the wire mill will be increased in capacity, and new rolling machinery will go into the rod mill.

★ ★ ★

There will be a complete renovation of the plant, to bring it to a high standard of efficiency, as has been done with their largest plant in Pueblo, Colorado. The company is installing turbo blowers in two blast furnaces and enlarging the open hearth furnaces, increasing the capacity of each from 110 to 170 tons per heat. The blooming mill will be given a general overhaul. In the billet mill, new shears will be installed and there will be a general overhaul.

★ ★ ★

A considerable amount of money is being spent in the rod mill to speed up production, improve efficiency, and produce larger bundles. The wire mill will be increased in capacity by making changes in equipment to produce more tonnage and to diversify the product lines.

Sheet and Tube Employees Complete Economic Education Course

More than 450 employees of **The Youngstown Sheet and Tube Company** graduated from the Company's economic education program in March. Certificates were presented at banquet dinners at the Company's Campbell Works Office Dining Room. H. E. Engelbaugh, Manager of the Youngstown District, addressed the group.

★ ★ ★

The men completed 15, two-hour sessions on "How America's Economic System Operates," given by **Paul W. Schumacher,** supervisor of economic training for the Youngstown District, and **Ted Patrick,** instructor.

★ ★ ★

The course was developed by Sheet and Tube's economics division. Since its inception in June of 1952, more than 1,350 Youngstown district Sheet and Tube employees have completed the course. Most of the "students" have been supervisors, but 250 of those graduating in March are production and maintenance workers.

★ ★ ★

The course includes a study of profits, wages, prices, capital equipment, as well as personal financial problems, pensions, social security and retirement.

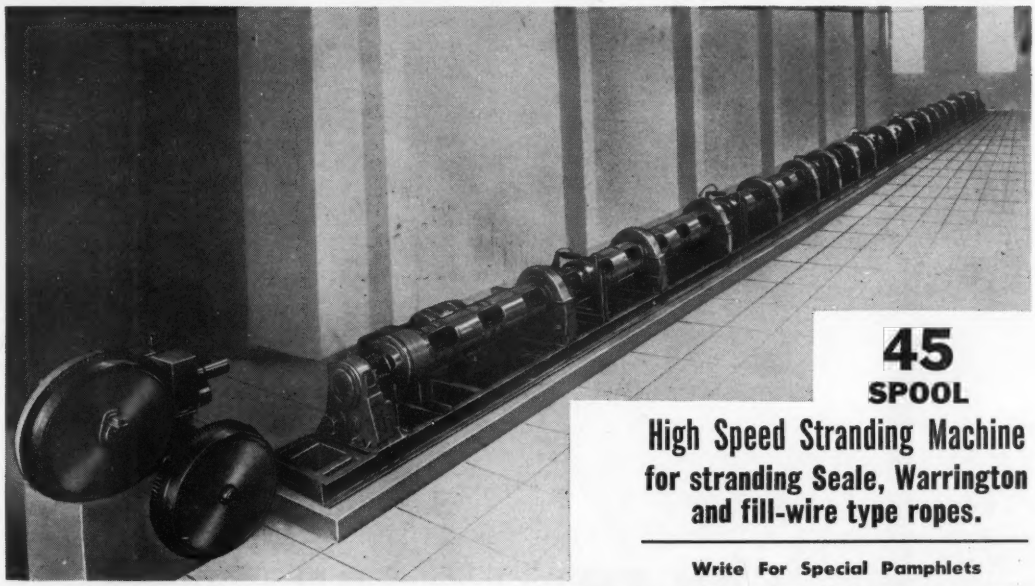
★ ★ ★

Tests given by Opinion Research Corporation of Princeton, N. J., show that Sheet and Tube employees completing the course scored appreciably higher marks than the national average for industry.

Carboloy Announces Price Reductions

Price reductions on standard, rough-cored header die nibs and standard brazed type stocked man-

NIEHAUS WIRE STRANDING ROPE CLOSING CABLE MAKING MACHINES



45 SPOOL
High Speed Stranding Machine
for stranding Seale, Warrington and fill-wire type ropes.

Write For Special Pamphlets

MASCHINENFABRIK K. A. NIEHAUS · GERMANY
DÜSSELDORF-RATH

drel nibs up to 19 per cent on the former, and 25 per cent on the latter, are announced by **Carboloy Department of General Electric Company,** Detroit.

★ ★ ★

The price decreases, according to the company, apply only to the larger size standard die nibs, 1-inch and over in diameter and 1⅜-inch and longer in length. On the mandrel nibs, the reductions apply only to stocked nibs in the line in sizes over 0.550-inch in diameter.

★ ★ ★

The company reports increasing demands for both heading die and mandrel nibs resulting in greater volume production, make it possible to pass on production savings to the user.

Celanese Corporation Establishment of Development Laboratories in North Carolina

Celanese Corporation of America, in support of expanding markets for its fibers in industrial and consumer applications, will shortly establish new development laboratories here which will serve as a link between fiber research at the Summit, New Jersey, laboratories and commercial production at fiber plants, according to **Harold Blancke,** president.

★ ★ ★

A 114-acre site of land has been acquired at Charlotte for the erection of the facilities. The first section of the building is expected to be in operation before the end of 1955, but the full extent of the undertaking will not be realized for several years.

★ ★ ★

Since the establishment of the Summit laboratories in 1947, that center has assumed the full burden of long-term research and development work and, in addition, a large share of the technical services of the Textile Division, **Dr. Robert T. Armstrong,** technical director of the Textile Division, pointed out.

★ ★ ★

The new Development Laboratories are designed to accomplish three broad objectives: 1. Provide a vital link between research at Summit and fiber production at existing and new plants; 2. Furnish a sound and broad technical base for improved applications development; and 3. Provide for expanded activities in product and sales development and better technical service to fiber customers.

★ ★ ★

Wire Cords Developed for Tires

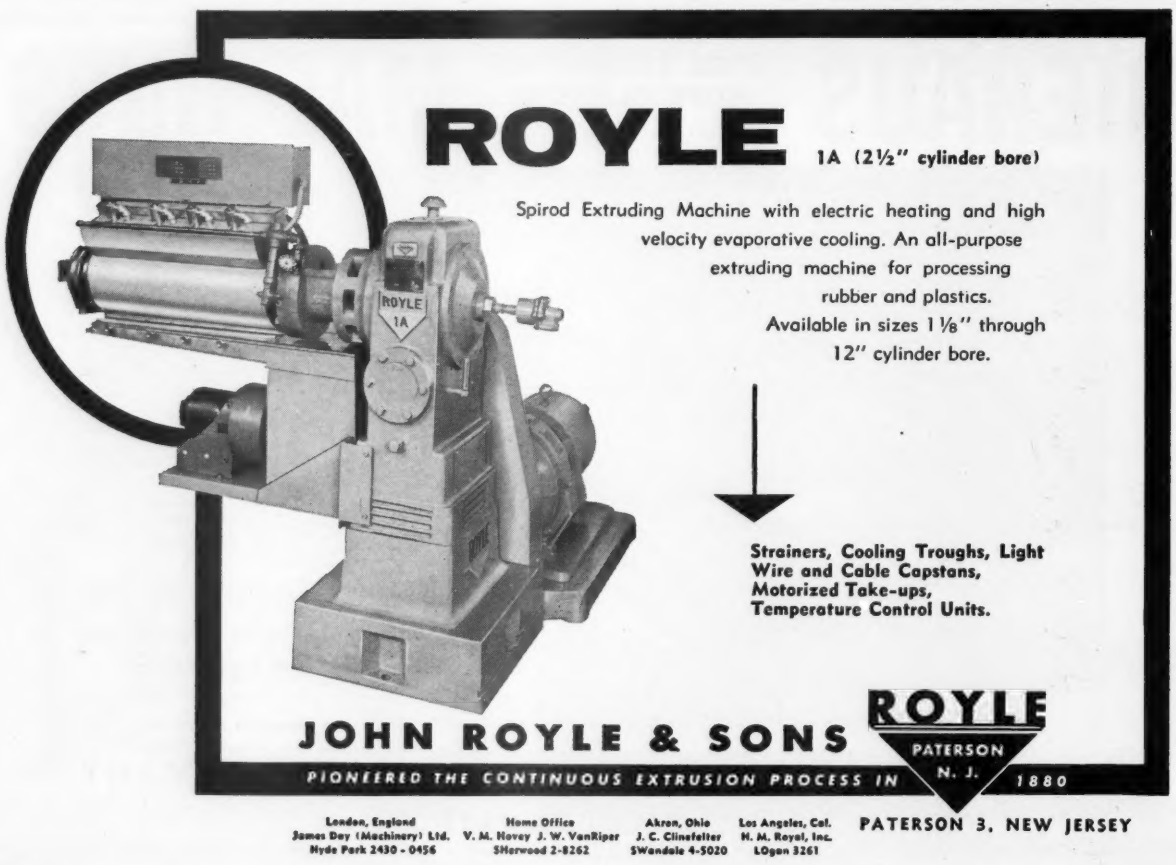
There won't be any more blowouts for buses and trucks, if passenger and freight carriers, vehicle tire manufacturers and wire rope producers have their way.

★ ★ ★

A way to reinforce rubber and synthetic tires with a brass-plated steel wire cord to make a blowout-proof tire has been developed by the Jones & Laughlin Steel Corporation, who started to work on a steel wire strand for tires before World War II.

★ ★ ★

First efforts were dismal fail-


ROYLE
1A (2½" cylinder bore)
Spirod Extruding Machine with electric heating and high velocity evaporative cooling. An all-purpose extruding machine for processing rubber and plastics.
Available in sizes 1⅛" through 12" cylinder bore.
Strainers, Cooling Troughs, Light Wire and Cable Capstans, Motorized Take-ups, Temperature Control Units.
ROYLE
1A
JOHN ROYLE & SONS
ROYLE
PATERSON
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1880
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Home Office
V. M. Hovey J. W. VanRiper
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Akron, Ohio
J. C. Clinefelter
SWandale 4-5020
Los Angeles, Cal.
H. M. Royal, Inc.
LOgan 3261
PATERSON 3, NEW JERSEY

ures. They attempted to make steel strand the same way cotton fibres are spun, using steel wires on an ordinary cotton spinning machine.

★ ★ ★

While tire manufacturers had learned that you can't form wire strand on cotton spinners, J&L also found out you can't make tire cord in the same way you make industrial wire rope. New machinery had to be developed, wire had to be drawn finer than the plant had ever used before and the wire had to be plated with brass, because rubber won't adhere to steel.

★ ★ ★

That J&L has been able to do all of these is affirmed by their Muncy plant's increase in tire cord capacity. The firm is able now to produce eight to ten times more tire cord than it could produce at this time last year.

★ ★ ★

At Muncy, engineers look at the work they have already done on this product as a beginning. They feel that this strong, light-weight, reinforcing wire cord will find many other applications, not only as a rubber reinforcing agent, but for use with other materials such as plastics.

Announces New Line of Improved Dielectric Testing Equipment

Peschel Electronics, Inc., 13 Garden St., New Rochelle, N. Y., has announced a line of new and improved testing instruments. These include:

Model P-1—Continuous insulation tester for magnet and other fine coated wires. Counts and records automatically and accurately all pinhole faults. Highly sensitive. 0 to 250 Volts DC.

★ ★ ★

Model H 20 DCX—A sensitive Hipot tester, combined with a fault indicator and counter for electric wire and cable. Has dual electrodes, detectors, indicators and counters. O to 20,000 Volts.

★ ★ ★

Audiotone continuity and leakage tester of 0 to 100 megohms and 1 microamp sensitivity. Maximum current 300 microamps. Gives audible alarm of faults. For production testing or repairmen.

★ ★ ★

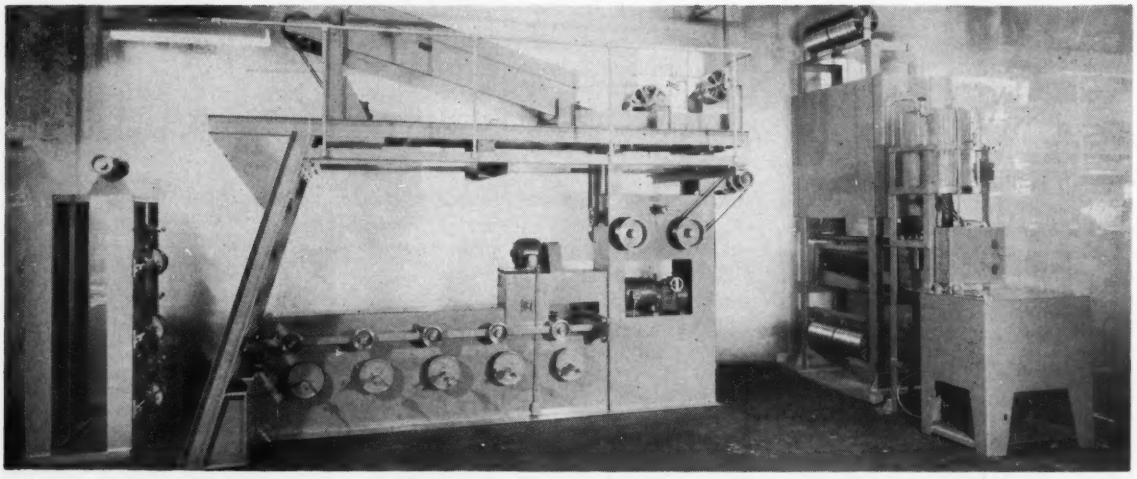
Low Resistance Ohmmeter—For very low resistance measurements where low operating voltage and low current is important to safety. Very sensitive and non-destructive. Range: .005 to 1 ohm.

★ ★ ★

High Voltage Test Sets—This K series provides more power than the low capacity Hipot Testers. For laboratory or production testing. AC, DC or AC/DC models from 0-2KV at 10 ma to 0-50 KV at 100 ma.

★ ★ ★

Hipot Testers, Series H—Sensitive. Avoids brute force method of testing for leakage. Shows faults not apparent in less sensitive testers. AC, DC or AC/DC models. 0-2 KV to 0-100 KV range.



BRAND NEW WIRE ENAMELING MACHINE WITH GAS HEATED OVEN AVAILABLE FOR IMMEDIATE SHIPMENT, WITH ENAMEL STORAGE, CIRCULATING AND FILTER SYSTEM COMPLETE.

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"American" AIM INSULATING MACHINERY COMPANY

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FAIRHILL AND HUNTINGDON STREETS

PHILADELPHIA 33 PENNSYLVANIA U.S.A.

FOR

EXTRA TONNAGE

FROM YOUR BAR STOCK AND WIRE DIES

COAT WITH

BORAX 5 MOL.

Borax and Borax 5 Mol Offer Many Advantages as a Coating Material

Here is dust-free, granular material that is readily soluble in water and dries quickly. The residual film is tight yet pliable... won't flake off! Borax is safe to use, easy to handle, and non-irritating to the skin. You can feed stock faster and you get longer, more accurate performance from your dies.

Check these advantages of borax-coated stock:

- COMPATIBLE WITH DRAWING LUBRICANT
- BETTER WORKING CONDITIONS
- FASTER BUTT WELDING
- LONGER DIE LIFE
- LONGER STORAGE SAFETY
- CLEANER TO HANDLE IN TRANSIT

Write for Technical Data Sheet #2 WD

PACIFIC COAST BORAX CO.

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LOS ANGELES • CLEVELAND
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MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS

Also, motorized output controls, electronic relays, high potential test sticks, DC high potential test and cable fault locating sets, universal power supply, electronic rheostats.

★ ★ ★

Every instrument is warranted. Full details on any Peschel instrument furnished upon request.

Brass Mill to be Built in Los Angeles

A new $13 million brass mill in Los Angeles County, Calif., will soon be under construction by **The American Brass Company,** it was recently announced by **John A. Coe, Jr.,** president of the Waterbury, Conn. firm. The new mill will be built for the production of copper and copper-base alloys, in the form of sheet, strip, rod, tubing and drawn copper products. Annual capacity is estimated at 30 million pounds. When in full operation, the mill will furnish employment for 500 persons.

★ ★ ★

The new plant will be of one story construction of heavy steel, and will be equipped with overhead crane service throughout, and occupy some 330,000 square feet of floor space. It is located in the Paramount district of Los Angeles, east of Garfield Avenue and north of Compton Boulevard.

★ ★ ★

C. Russell Epley has been named manager of this new facility. Formerly Mr. Epley was San Francisco district sales manager.

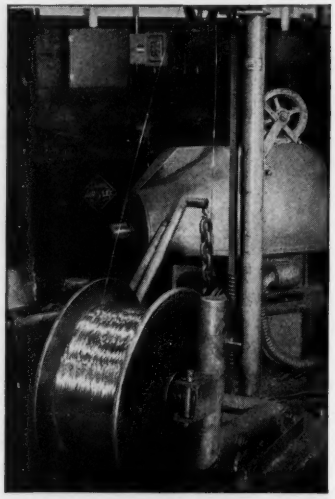
★ ★ ★

The American Brass Company, a wholly-owned subsidiary of **Anaconda Copper Mining Company,** will have a total of twelve factories in the U. S. upon completion of the Los Angeles plant, and when a recently-announced $25 million aluminum plant at Terre Haute, Ind. and a $2.5 million production facility for flexible metal hose and tubing at Mattoon, Ill. are finished.

To Receive Parlin Award

Thomas Mellon Evans, President, **H. K. Porter Company, Inc.,** Pitts-

Balanced and True...



mean high speeds for you!

Faster, faster, is the production cry! And Apco Mossberg is constantly at work designing and refining to make better reels for high speed wire drawing.

Apco Mossberg Reels are manufactured to extremely close tolerances . . . with particular emphasis on trueness and balance. This has been going on for over half a century, beginning with the original Frank Mossberg Company.

You will be interested also in Apco Mossberg's engineering service. Each and every inquiry about steel reels, spools or bobbins is given individual treatment, so bring your next problem to Apco Mossberg. Suggestions and solutions will be offered without obligation. Write for details.

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The original Frank Mossberg Company

APCO MOSSBERG COMPANY
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BUNCHING
(TWISTING)
AND
STRANDING
IN THE WIRE AND
GENERAL MANUFACTURING
PROCESSES

SPECIALIZED
ENGINEERING
AND
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FACILITIES
AT YOUR SERVICE

Expanding application of twisting principles to the production of many products is reflected by an ever-increasing demand for both H-D standard equipment as well as machines especially engineered to solve varied production problems. Week after week surprising new uses are developed through the close cooperation of our engineering department with manufacturers in many fields.

Write today for our New Technical Bulletins. Tell us what you make—or contemplate making and your inquiry will receive prompt attention.

HASKELL-DAWES
MACHINE CO., INC.
2231 E. ONTARIO ST.
PHILADELPHIA 34
PA.

burgh, will receive the Eleventh Annual Parlin Memorial Award for "outstanding contribution to the field of marketing" it was announced by **Edward Bloom,** President of the Philadelphia Chapter, American Marketing Association.

★ ★ ★

Mr. Evans will accept the award from the AMA Chapter at a dinner at Philadelphia's famous Union League on Wednesday, May 18th, when he is scheduled to deliver the annual Parlin Memorial Lecture.

Notes 50th Birthday

National Electric Products Corporation celebrates its 50th anniversary in 1955.

★ ★ ★

The corporation which now has plants in Torrance, California and Linden, New Jersey and sales offices throughout the nation, was founded in 1905 at Economy, Pa. (now Ambridge) where the main plant is today.

★ ★ ★

National Electric president and founder, **William Christopher Robinson, Sr.,** recognized the advantages in grounding electrical distribution systems and foresaw the need for steel raceways to carry wiring throughout buildings. He founded the company, then known as National Metal Molding Company, eight years before the Underwriters' Laboratories made grounding mandatory, and two years before the first municipal ordinance on grounding was passed in the city of Chicago.

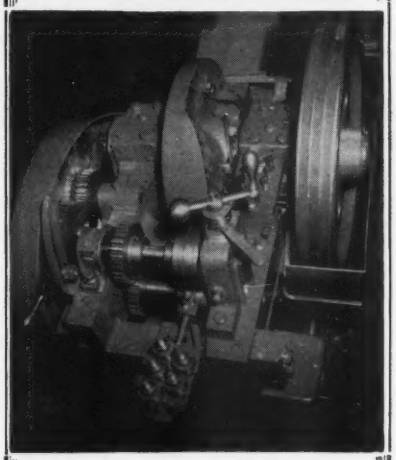
★ ★ ★

First manufacturer to employ the Sherardizing process of galvanizing to steel electrical conduit, National Electric is today the major producer of this corrosion-resistant raceway. Sherarduct installations made in the early days of the firm's history are still in use.

★ ★ ★

In 1928 the company's name was changed to National Electric Products Corporation.

1000
STAPLES
PER MINUTE!!!
are made on the
HUMPHREY
STAPLE MACHINE



Top View, showing Fly Wheel & Gears

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Double Pointed Tacks

48 different leg lengths
Gauges 8 through 18

Efficient, Compact
Easily Adjustable

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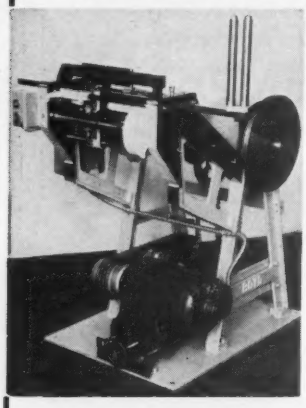
USE THE NEW BOYD #1200 HEAVY DUTY SPOOLER

Designed for the spooling or coiling of heavy materials on large diameter spools or in coils.



Positive screw reversing mechanism and change gears offer a wide range of distances and speeds for traverse rates to accommodate various sizes of wire or other materials.

Large adjustable slip clutch provides constant speed of winding to allow for build-up and to produce uniformity. This makes this machine an excellent addition to your drawing or finishing machine producing your product at a point where it is to be packaged.

Supplied with gear motor and starter, Hi-Lo pulley and motor base. Can also be had with predetermining counter and auto-stop motion.

Its versatility allows it to be easily suited to meet your particular requirements in spool or coil diameters and traverse widths.

Send for full particulars

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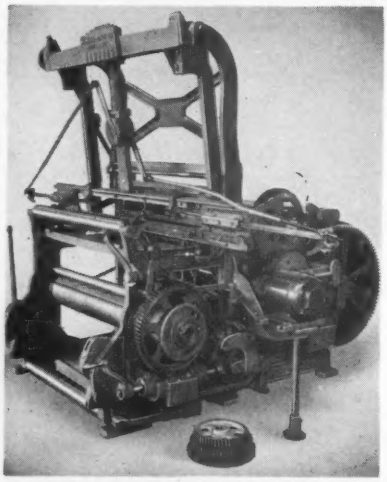
NEW MODERN FLY SCREEN WIRE LOOMS

Four Sizes: 36", 48", 60" and 72" Widths



TYPE No. 239

Made in 36" and 48" widths:

Shown at the left.

TYPE No. 239-360

Made in 60" and 72" widths:

These larger looms have stronger frames and heavier construction throughout.

The take-up and screen tension of the 60" and 72" widths, is effected through a ratchet, instead of the usual worm gear and weight arrangement.

Speed changes of the loom are made by changing different sizes of the motor drive pinions.

On the 48" width and wider, extension slides are provided to support and guide the longer shuttle bars.

Steel shell warp drums are used.

All looms are provided with an electric stop, which instantly stops the machine when either a warp or a cross wire breaks.

write for details on this or other type looms you may need

We make four heavier types.

MUMMERT-DIXON CO.

HANOVER 3, PENNSYLVANIA

The American Chain and Cable Story

(Continued from page 559)

It was in this same iron mill that anthracite coal was successfully tried and proven as a source of heat. Since anthracite coal has a different ignition point than bituminous, there were a number of unsuccessful attempts to use it in the beginning. Spurred on by a bituminous coal shortage during the War of 1812, Hazard and White experimented with anthracite which they bought in Philadelphia for $1.00 a bushel.

★ ★ ★

After two unsuccessful attempts to fire the furnace, the mill hands "shut the furnace door and left the mill in disgust". Fortunately one of the men left his jacket in the mill, and returning for it about half an hour later, noticed that the furnace door was red hot. Upon opening it, he was surprised to find the whole furnace a glowing white heat. The other hands were summoned, and four separate parcels of iron were heated and rolled from the same fire. By pure accident, they learned that all they had to do to burn anthracite successfully was to close the furnace door and let it alone. Shortly after this, Hazard and White purchased the **Lehigh Coal Mining Company** near Mauch Chunk—the town now known as Jim Thorpe.

★ ★ ★

The men soon found that much of their coal cost lay in the cost of its transportation overland to Philadelphia. This led to the formation of the **Lehigh Navigation Company** which used the Lehigh River for transporting its coal to the markets, principally to and through Philadelphia. The Lehigh canal was opened in 1829 and, three years later, the Delaware division was completed providing a permanent "slack-water" route to Philadelphia. Hazard and White consolidated their coal and transportation business into what was known then, and until this day, as the Lehigh Coal and Navigation Company. The success of the canal on the Lehigh River assured the establishment of the town of

Mauch Chunk. Once again Hazard and White were the prime movers. They erected a blast furnace there in which they smelted iron by the use of anthracite coal.

★ ★ ★

The second railroad to be built in this country, the **Mauch Chunk Switchback Gravity Railroad,** was started in January, 1827. It was used for transporting coal from the Summit Hill mines to the town of Mauch Chunk. It was operated by gravity, the empty cars being hauled back to the mines by the mules, while the mules rode down with the coal in special mule cars.

★ ★ ★

The Hazard Wire Rope Works began operation in Mauch Chunk in 1846 the ropes being laid up by hand on a rope walk. A few years later, **Erskine Hazard** and his son, **Fisher,** who was now associated with him, designed and built America's first wire rope machine.

★ ★ ★

The Hazard Manufacturing Company was incorporated in March, 1868 and in 1870 the plant was moved to Wilkes-Barre. Since that time it has grown from a small wire rope mill to the present large plant supplying the needs of customers in this country and abroad.

★ ★ ★

So we find that the pioneering instinct of Hazard brought into being the first wire rope manufacturing machinery and many other important developments since that time. In more recent years, in order to keep abreast of the transition from coal to oil, the American Cable and Hazard Divisions have added a wire rope plant at Houston, Texas to serve the needs of the petroleum industry.

★ ★ ★

The talents of the pioneers in our wire mills have contributed to the transition from the use of iron wire through the several grades of steel that are in common usage today. Now research and development have given us still another grade of wire rope—VHS—that is 15% stronger than comparable,

Internationally known specialists

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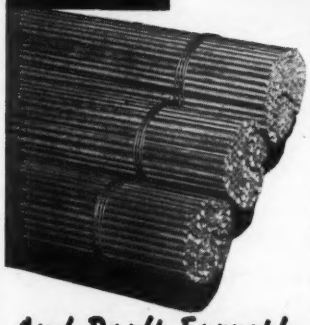

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Contact your nearest CF&I representative for full details on how CF&I Straightened and Cut Wire can best serve your needs.

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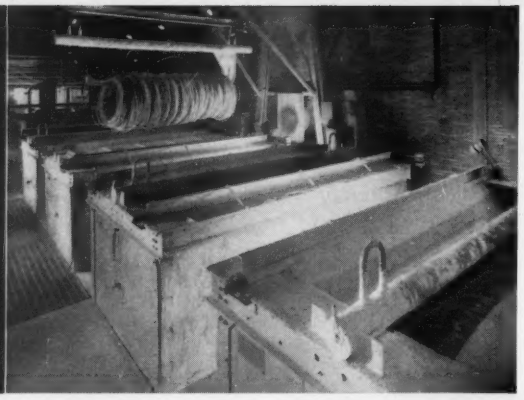

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Pacific Coast Regional Meeting. June 10, 1955, The Palace Hotel, San Francisco, Calif. William Mohr, Colorado Fuel and Iron Corporation, Program Chairman.

Annual Convention of The Wire Association, November 14-17, 1955, La Salle Hotel, Chicago, Ill. General Program Chairman: John A. Moritz, Jr., Standard Industrial Compounds Company.

Plan now for these meetings.

THE WIRE ASSOCIATION

453 MAIN STREET • STAMFORD, CONN.

standard improved plow steel ropes, to keep pace with the greater loads and stresses to which industry is subjecting its ropes in service.

Pressurized Die for Wire Drawing

(*Continued from page* 560)

bricant for cooling as well as the high pressure. It may be that a lubricator ahead of the first die will still be required.

★ ★ ★

For lower pressures, up to several thousand psi, the benefit would be almost wholly from better lubrication and/or cooling, excluding the roughly constant effect of tension ahead of the second die. As pressures are increased still farther, drawing should be accomplished with less effort because of the approach to pressures at which the wire is extruded. At least structurally much higher pressures than a few hundred psi should be possible but whether other factors would prevent the approach to the range of extrusion pressures would best be determined experimentally.

★ ★ ★

Of course, the beneficial effects, pulling forces, speeds, and percentages of reduction possible, should be determined experimentally in any case. The Fig. 2 form entirely of steel would be relatively easy to make and experiment with, and should be used for initial tests with non-ferrous or soft wire materials. Only after general characteristics are proved should the Fig. 3 construction with harder dies be attempted.

★ ★ ★

Advantages would be (a) better lubrication, (b) better cooling, (c) possibly beneficial stress environments of pretension and extruding assisting pressures, and (d) closed system lubrication with its advantages of cleanliness, less waste, and possibility of using lubricants previously barred, such as carbon tetrachloride or freon.

★ ★ ★

The predicted behavior is purely an educated guess. None of the devices have been tried by the writer or by anyone else to his knowledge.

(*Continued from page* 558)

er with increased Vicat temperature and higher melting point, indicate a remarkable increase in service temperature for present-day "Alathon". Cold brittleness is controlled by molecular weight. Note the improvement in this property with the change in melt index from 1.6 to 0.3. This pays dividends in long outdoor life, as shown by Wallder et al[2]. Their accelerated aging data indicate a gradual rise in brittleness temperature over the years. The resins of higher molecular weight, starting lower, take much longer to fail.

★ ★ ★

The phenomenon known as "solvent crack" or "environmental stress cracking", deserves special mention. Some kinds of polyethylene will fail when subjected to biaxial stress in the presence of a surface-active agent. DeCoste et al[3] have covered the subject thoroughly and pointed out a correlation between crack resistance and molecular weight. "Alathon" 3 is very good in this respect. By the

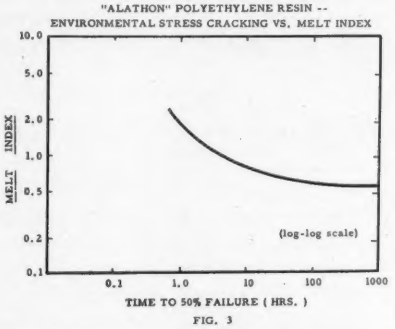

FIG. 3

present test, "Alathon" 3 will resist cracking for many weeks, while lower molecular weight products have failed within a few hours or minutes. Our recent goal has been to build a polymer with good resistance in the normal molecular weight range. This would be a real advantage to those wire-coaters who encounter increased costs in processing the more viscous high molecular weight resin. We are glad to report that we have reached this goal. Figure 3 is a plot of melt index against time to failure from environmental stress cracking. The curve becomes asymptotic

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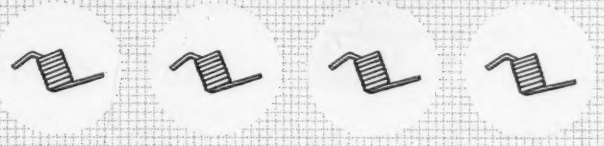

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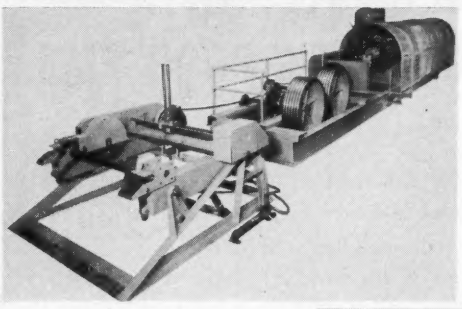
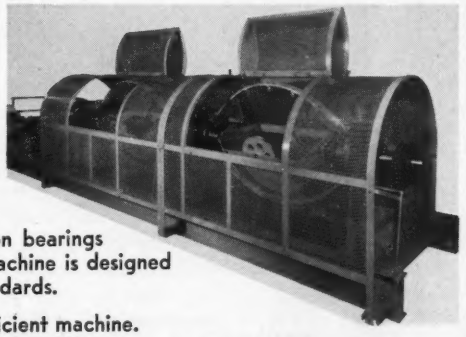
THREE-WIRE HEAVY DUTY TWISTING MACHINE



Built to handle wire from #14 to 500,000 circular mils in size on cradle reels.

Cradle reels either 30", 36" or 48" in diameter.

Rotor speeds from 800 r.p.m. to 30 r.p.m. controlled by gear box and dual drive.



Capstans either single with fleeter sheave as shown or double with diameters of 30", 36" or 42". Rates of lay from 1½" to 36".

Welded steel frame, anti-friction bearings and multiple roll guides. The machine is designed and built to our usual high standards.

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If you require a Vinyl compound rated higher than 105 degrees C for special applications, we suggest you communicate with us, as we may have a compound to meet your requirements.

Your inquiries are invited.

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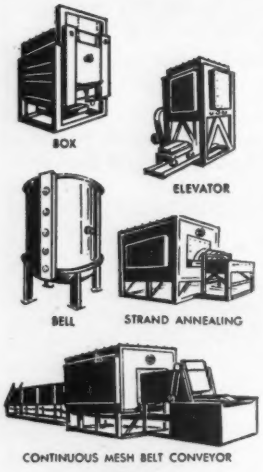

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at melt index 0.6, indicating superior resistance to cracking below this level.

★ ★ ★

To meet the exacting demands of wire and cable service, it is generally advisable to stabilize polyethylene against the action of heat and light. Antioxidants inherited from the rubber industry have proved effective heat stabilizers. Wallder et al[2] showed that carbon black is a very effective light stabilizer. It absorbs the ultraviolet radiation which would otherwise degrade the polymer. Since the carbon causes a slight increase in dielectric loss, the black compositions are used mainly for jacketing where outdoor service is involved. For insulation, particularly in high frequency and high voltage applications, one generally uses the "natural" resin containing only an antioxidant. Interest is increasing in other additives. For instance, considerable attention is being paid these days to porous polyethylene for wire covering. For this there is a blend containing a blowing agent. In short, to meet the needs of the wire and cable manufacturer, there is a large and growing family of compounded "Alathon" resins, each engineered for a particular type of service. Table III lists the forms now available, with information on additives and some typical end uses.

TABLE III

COMPOUNDED "ALATHON" POLYETHYLENE RESINS FOR WIRE & CABLE

PRODUCT	MELT INDEX	ADDITIVES	TYPICAL USES
"Alathon" 5, NC10	1.6	07% DPPD	general insulation, especially for high frequency and high voltage
"Alathon" 5B, NC10	1.6	colorless antioxidant	same, plus uses where insulation must be colored
"Alathon" 5, BK31	1.6	.07% DPPD; 1.0% channel black	WD-1 infantry field wire
"Alathon" 5, BK 2[illegible]	1.6	.07% DPPD; 2.5% channel black	line wire, service drop wire
"Alathon" 5, BN07	1.6	non-exuding antioxidant; brown pigment	TV lead wire
"Alathon" 6, NC 10	---	colorless antioxidant; blowing agent	TV lead wire; coaxial cable; telephone cable
"Rulan" 2	3-4	fire-resistant compounds; antioxidant	GTO cable; anode lead wire; building wire
"Alathon" 3, NC10	0.3	none	base resin for "Alathon" 4
"Alathon" 4, BK20	0.3	.07% DPPD; 2.5% channel black	cable jackets

DPPD - diphenyl p-phenylene diamine

★ ★ ★

In conclusion, the polyethylene molecule has been redesigned and rebuilt to improve its utility and

extend its range as a wire covering. In addition, special compounds have been developed which extend the range even farther. Continued progress can be expected.

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4. M. J. Roedel et al, J. Am. Chem. Soc., 75, 6110, 6113, 6118, 6123, 6127 (1953).

Puerto Rico Gets $3,500,000 Steel and Wire Mill

(*Continued from page* 561)

The enterprise was established by Charles Greif Raible of Cleveland, Ohio, and it is stated that the Cleveland engineer and his associates already have invested more than $2,000,000 in private capital into the venture and expect to add another $400,000 by the end of the current fiscal year. In addition, the Puerto Rico Industrial Development Company and the Government Development Bank, two agencies vitally engaged in the economic development program, have invested about $1,500,000 in the form of land, buildings and loans.

★ ★ ★

The company was attracted to Puerto Rico by the Commonwealth's "Operation Bootstrap" industrial incentive plan, which grants to qualified manufacturers, among other things, 10 full years of freedom from local taxes from the date commercial operations are started. This company like the more than 300 other manufacturers who also have established plants on the island, did not have to worry about federal income taxes. Since the Commonwealth does not have a vote in Congress, the federal income tax law does not apply.

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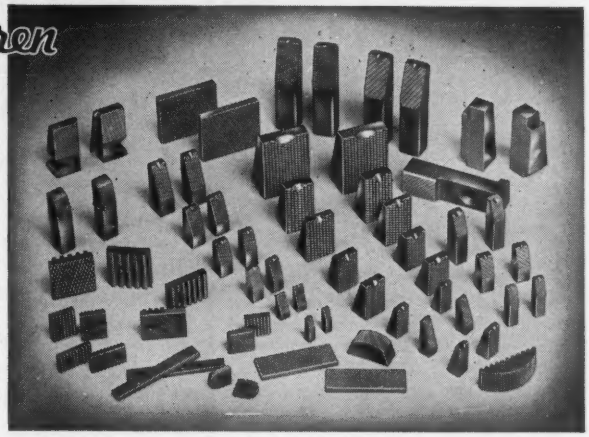

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Instead of worrying, wondering what to do about those loose, frayed ends on your glass-braided wire, turn the problem over to us and we'll show you how to make every strand lie down in its proper place.

Chemical Products
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King Philip Rd., East Providence, R. I.

The Role of Wire and Cable in Military Communications

(*Continued from page* 546)

apart require a party line service, in other words, the dispatcher at one end must be able to talk to each point along the line. Only an open wire pair will provide this type of service over the distances involved without the complication of repeaters, etc.

★ ★ ★

Consideration is being given to the possibilities and application of a one or two pair open wire line that can be constructed rapidly, all work accomplished by a man on the ground, by the use of carrier telephone equipment provide multiple circuits and use a minimum of material. A prototype of such line is the new **Bell System** rural construction.

★ ★ ★

Military transmission lines in combat and rear areas are exposed to damaging conditions to a greater extent than commercial lines. Restoration to service with minimum delay is of extreme importance. The problem of fault location techniques and portable field test equipment is not easily solved. At this time, the possibilities of pulse reflection technique are of great interest. To date, it has not been possible to obtain a simple lightweight test set suitable for use on the varied types of lines. What advantages do we hope to derive from this technique? First, only the man operating the test set is involved — it is not necessary to have a talking circuit to a helper on the line, a good parallel pair is not needed and it is not necessary to remove any equipment from the line. Just connect the test set to the pair in trouble and locate the fault. The differences in characteristics between field wire, cable and open wire, the range of line lengths from a few miles for field wire to 75 to 125 miles between attended points on open wire and the need to have accurate location of the fault whether a quarter mile or 50 miles from the test set are

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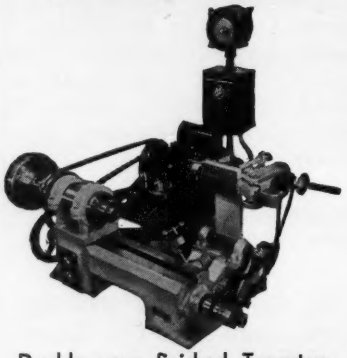

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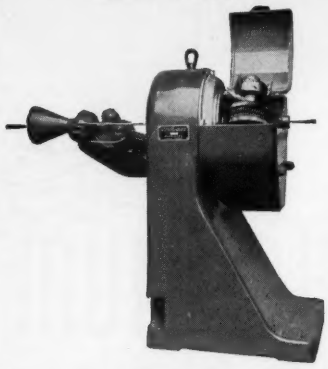

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factors that make this problem difficult.

★ ★ ★

From various quarters during recent years, claims have been made that the military services were buying the same identical wire or cable under different specifications, each with different requirements. Since early in 1951, a group has been working on this problem. First organized under the **Munitions Board Standards Agency,** the present task group is under the Office of the Ass't. Secretary of Defense, Supply and Logistics. The Chief, Outside Plant Equipment Section, SCEL is member of this task group. This is not a simple program, because little if any foundation has been established for the original claims. The task group believes that standardization of some factors can be achieved and be beneficial. The study now in progress includes wire sizes, conductor stranding, physical characteristics for the most commonly used insulation and jacket materials, test methods and test equipments. It is expected that the present program will require about a year of work before any conclusions can be reached. The immediate goal is formulation of a specification or group of specifications covering a single insulated conductor that can be considered as the basis for standardization by the Army, Navy and Air Force.

★ ★ ★

When armies take the field, it is hard to visualize the magnitude of the task of supplying communications. The following figures are taken from a report of activities in Europe during World War II. In the first six months in France after the initial landing (and mostly constructed in the last three months), the following approximate list of main line facilities were furnished:

a. 2500 long distance circuits with about 125,000 circuit miles on underground cable and 20,000 miles on open wire.
b. 1200 miles new OW line built.
c. 3300 miles of French OW rehabilitated.
d. ComZ headquarters were handling 25,000 local calls a day and about 5000 toll calls.

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These figures were as of 1 Dec. 1944. By VE day (May 1945) there were 325,000 circuit miles in main line circuits. Paris headquarters were handling 54,000 calls a day. About 3000 sheath miles of cable and 4500 miles of open wire lines were in use in France and Belgium. By June of 1945, an additional 3000 sheath miles of cable and 1500 miles of new open wire pole line had been built in Germany. All of this does not include the thousands of miles of field wire laid all over the countryside by the army.

★ ★ ★

To present this picture in terms of places that are more familiar to us, let New York City represent the location of the theater headquarters which was in Paris. If this wire net that was installed in Europe were to be in the United States, it would mean that Philadelphia, Baltimore, Washington, Boston, Montreal, Buffalo, Cleveland and Columbus, Ohio would be connected to New York with multichannel telephone toll line type circuits. In addition, countless cities and towns between New York and these points—in fact the whole area enclosed by these cities, would be tied into this communication system.

★ ★ ★

Providing adequate communications requires the design, manufacture and coordination of hundreds of pieces of different equipments, training and coordination of personnel. Wire and Cable is the backbone of the communication system; vast quantities are required in wartime and the organizations represented at this symposium can take a bow for their ability to assist the signal corps in the difficult research and development program and then to produce when required this great quantity of varied constructions, most of which are peculiar to the military for good and sufficient reasons.

★ ★ ★

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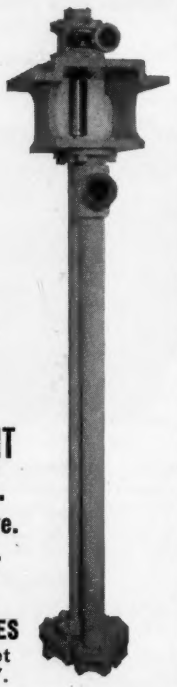

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Phosphate Coatings for Facilitating Cold Welding

(*Continued from page* 552)

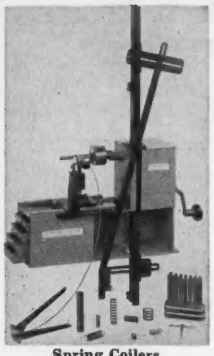
coldworking consist commonly of crystalline tertiary zinc phosphate. This coating is practically insoluble in neutral aqueous solutions. The solubility decreases with rising temperature, so that phosphated material can at high temperatures be brought into contact with water without danger. The coating is soluble in acid as well as in caustics. In the first case water-soluble zinc salts are formed; in the latter, the zinc goes into solution in the form of a complex. These reactions of the zinc phosphate postulate certain precautionary measures in the treatment of the coating. Contact between the phosphated material and pickling acid or any alkaline agent must be strictly avoided.

★ ★ ★

The coatings of zinc phosphate are stable up to 400° C in air or in a neutral medium up to 700° C. Above these temperatures the zinc phosphate is changed by reaction with the material coated to zinc oxide and phosphorus combinations, with resultant sublimation of the zinc oxide. Because of the crystalline structure of a phosphate coating, pores and capillaries are present which make for great absorptive capacity for oils, fats and the like. The porosity is naturally dependent upon the crystal size and the thickness and density of the coating. To the already known properties of a phosphate film should be added increase of corrosion protection, increase of adhesion of lacquers and painting, as well as decrease of friction.

Use of the Phosphating Process in Wire Drawing

This has its greatest advantage in the case of steel wire with a carbon content over 0.5%. This is illustrated by the following example. Steel wire (0.76% C) is pickled in H_2SO_4 treated with bonder Z700, limed and dried, then, with barium stearate as lubricant, drawn dry in a multiple machine from 3.4 mm. to 1.65 mm. in 5 drafts, with a total reduction of cross-section of 76% and speed



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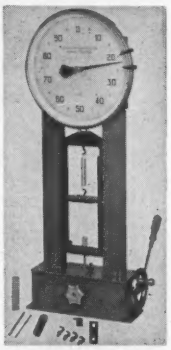

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of 100 to 150 meters per minute. Under these conditions about 32 tons are drawn with one die setting, although of course, out of respect to tolerance the last die was changed after 16 tons. Contrasted with this is the drawing of only 2 or 3 tons of unphosphated material.

★ ★ ★

In a further example the lengthening of tool life in a single draft is more exactly given: Steel wire (0.92% C) treated with bonder Z700 was drawn dry in 7 drafts from 4.5 to 1.5 mm. with a total cross-section reduction of 88.9% (final strength 335,600 lbs. per sq. in.). The lengthening of die life was from 8 to 12 times for the first four drafts, and from 10 to 5 times for the subsequent drafts. It should also be remarked that wear was equally distributed over the die hole, and after refinishing the die can be used again for a larger dimension. It is said quite commonly that the lengthening of die life in drawing phosphated steel wire is from 3 to 8 times that of unphosphated wire.

★ ★ ★

The use of the phosphating process in the steel wire industry is especially advantageous if great reduction of size with final diameter under 25 gauge is required. Phosphating is generally done after the final annealing with diameter 1.2 to 1.0 mm. As a rule highspeed wet drawing machines are employed, operating at speeds of 3,000 to 4,000 ft. per minute.

Phosphating in Screw Manufacture

A further very important field of use is that of phosphating upset wire for facilitating the manufacture of screws. This is indicated by the fact that already about 30% of all the phosphating of wire belongs in this category. Through phosphating the number of intermediate annealings and the wear on pressing dies are significantly diminished.

Execution of Phosphating

(a) Pickle in 15 to 20% sulphuric acid, with inhibitor; 104°

to 140° F, for iron and steel wire.

10 to 15% hydrochloric or muriatic acid, with inhibitor; 68° F, preferably, for finer gauge steel wire.

(b) Cold water spray or bath.

(c) Preliminary rinse with Bonder-V-salt (cold); preferably however by higher temperature corresponding to the temperature of the phosphating bath). The V-salt preliminary rinse will generally only be used where steel wire with different carbon contents is processed in a Bonder-plant. A more uniform and thick film is thereby obtained.

(d) Phosphating. The execution of the phosphating is in accordance with the directions of the firms supplying the various phosphating systems, and are generally applied at a temperature range of 104° to 140° F.

(e) Cold water rinse, preferably in bath.

(f) Subsequent treatment:

1. **Borax 4 to 5% solution, 176°F, 2 to 3 minutes immersion. The borax treatment can be used either before dry or wet drawing. A special advantage of this treatment lies in longer tool life, especially for very hard steel wire with carbon over 0.8%.**
2. **Lime, about 2 to 3% suspension, 176° to 194°F., immersion 1 min. The lime treatment is applicable before the dry drawing.**
3. **Soap solution or neutral grease emulsion.**

★ ★ ★

Soap solution (preferably sodium soap) 2 to 4%, 158° to 176° F., immersion about 1 min. Perhaps addition of 0.1% sodium nitrate.

★ ★ ★

Neutral drawing fat emulsion mixture according to the directions of the supplying firm. Generally 5%, 158° to 176° F., immersion 1 min.

★ ★ ★

The lubrication in aqueous solutions is preferably effected before the subsequent wet drawing without interposed dry draft.

Lubricant for Dry Drawing

For dry drawing of iron or steel wire, sodium soap in powder or needle form is still most generally

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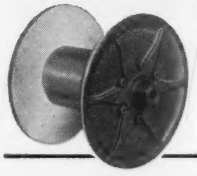

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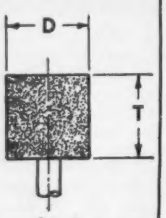

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used. In the manufacture of spring wire with phosphate coating, an admixture of about 2% of molybdenum sulphide is kept in the soap. One acquires thus a darker polished drawn surface and increased protection against corrosion. In recent days dry lubricants have been used based on alkaline earth metal-stearate, for example, calcium-, barium- and aluminum-stearate. The life of the drawing tools is definitely increased through the use of stearates. Experience has shown that these lubricants give a brighter polished surface to the finished wire than the dry soap. Cold upset wire is frequently, at the desire of the screw manufacturer, drawn with stearate or with a mixture of stearate and soap in the proportions 1:2 to 2:1 in order to increase the life of the reducing dies.

Lubricant for Wet Drawing

As lubricant for wet drawing of phosphated iron and steel wire, neutral drawing grease emulsions are generally preferred over the earlier generally used soap solutions. The neutral reaction of the lubricant bath produces a careful management of the phosphate film and therewith a lengthening of the life of the last die in multiple wet drawing. Besides, through the application of a neutral drawing grease emulsion, a darker polished drawn surface is obtained than by the use of soap solution.

Final Treatment of Drawn Wire

Hot Galvanizing. — The phosphate coating gives no difficulty in the hot galvanizing of iron and steel wire. Experience thus far has shown that with hard drawn steel wire with phosphate coating, hydrochloric or muriatic acid pickling is unnecessary before hot galvanizing. However the immersion in a soldering fluid before galvanizing must in such case be continued longer (at least 8 to 10 seconds). This has the advantage that the bundle of wire to be galvanized can be laid dry upon the run-off spool.

Brightening and Copper-plating

Brightening and copper-plating is generally performed in the last drafts. A useful formula for copper-plating is described in the following example from the industry:

★ ★ ★

Spring wire (0.7% C) is phosphate-coated at a diameter of 3/16 inch, reduced by 4 dry drafts with dry soap as lubricant to 3/32 inch and finally drawn down to less than 1/16 inch by six wet drafts. The wet drafts will preferably be performed in a neutral drawing grease emulsion. The wire then runs through an acid copper sulphate solution to which finally tin salt is added for the brightening of the copper-plating. Whereupon then still another draft in acid-resisting drawing grease emulsin to about 18 gauge. A brightening of steel wire can be acquired by this means so that for the last two drafts acid drawing grease emulsion can be used as lubricant.

★ ★ ★

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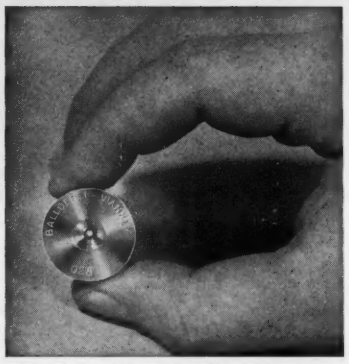

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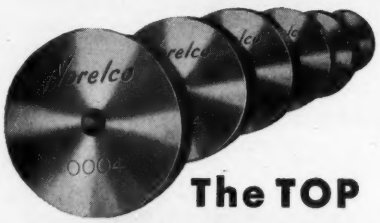

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in recent years, and the end is not yet. The process will doubtless be still further improved and simplified.

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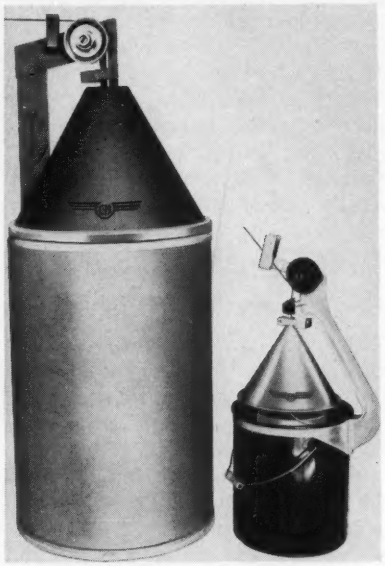
The Coulter & McKenzie Machine Company, Bridgeport 3, Conn., announces a dereeling device for payoff of soft non-ferrous material. The "Dereelers" can be attached to the top of a 20" diameter drum or to a conventional 5 gallon pail. The 20" diameter drum (500 lb. capacity) is loaded with wire in one continuous strand.



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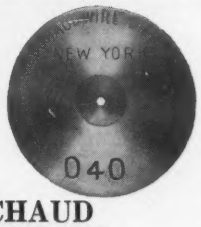

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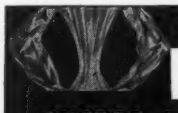

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Nopco Names New President

The election of **Ralph Wechsler** of Maplewood, New Jersey as President has been announced by the Board of Directors of **Nopco Chemical Company,** Harrison, N. J. He will succeed **Thomas A. Printon,** President since 1949. Mr. Printon will continue as Chairman of the Board.

★ ★ ★

Prior to election as President, Mr. Wechsler had served as Treasurer. He has been connected with the firm since 1921 when he joined the company as a chemist. A few years later he became chief chemist and was responsible for manufacturing operations and was elected to the Board in 1927. He will also act as chief officer of Metasap Chemical Company, a wholly owned subsidiary.

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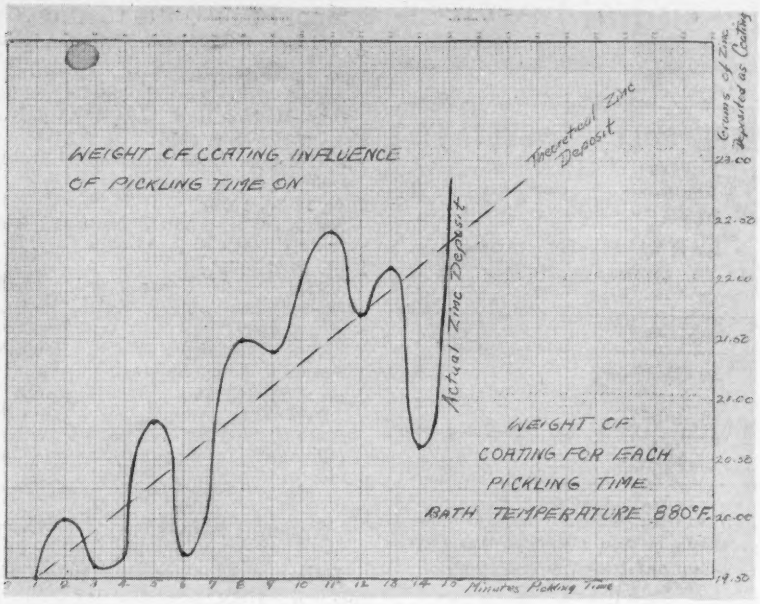
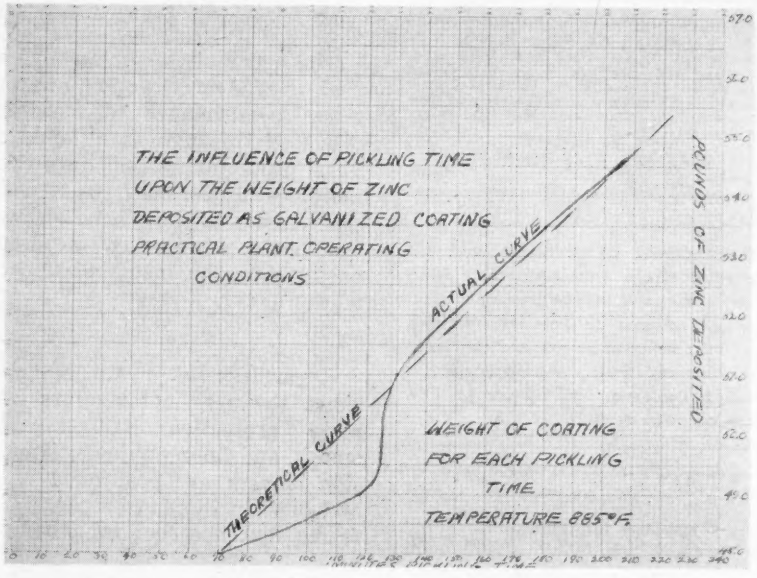
Hot Dip Galvanizing Is A Science (*Continued from page 556*)





Graph showing the weights of zinc deposited as galvanized coating, under practical plant pickling and galvanizing operations.

irregularities when starting up that show the pickler and the galvanizer what adjustments, or material additions must be made to obtain the smooth, uniform operations and results that always come an hour or so after the plant has been put into operation.

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Elected President of Seymour Manufacturing Co.

Robert M. Terry has been elected president of **Seymour Mfg. Co.**, Seymour, Conn., succeeding **Alton G. Wentworth**, who has resigned. Mr. Terry joined Seymour in September, 1954. He was previously affiliated with Abbott Ball Co.

Coming ASTM Meetings

SCHEDULE OF ANNUAL AND COMMITTEE WEEK MEETING DATES

June 26—July 1, 1955:
ASTM 58th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Feb. 27-March 2, 1956:
ASTM Committee Week, Hotel Statler, Buffalo, N. Y.

June 17-22, 1956:
ASTM 59th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Sept. 16-22, 1956:
ASTM Pacific Coast Meeting, Hotel Statler, Los Angeles, Calif.

Feb. 4-8, 1957:
ASTM Committee Week, Benjamin Franklin Hotel, Philadelphia, Pa.

June 16-21, 1957:
ASTM 60th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. (Changed from previous announcements)

Announces New Line of Motors

Reliance Electric and Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio, has announced a new line of Totally-Protected a-c. motors.

★ ★ ★

The new motors combine eye appeal, rugged construction, and precision performance to meet the needs of this age of automation. Total protection is built into these motors—all the way from solid-cast frames to the plastic sleeving that protects brazed coil head connections in the insulated "heart" of the motor.

★ ★ ★

Regardless of mounting positions, the new motor offers complete protection against drip, splash, and falling objects. Ventilation louvers are positioned "high and dry" in the end brackets. The frame extends beyond the coil heads to give full protection to the windings, an especially important feature when end brackets are removed. Compact, rugged brackets ensure shockproof shaft support by placing the bearing mountings closer to the frame.

★ ★ ★

All of these features of the new Reliance a-c. motors add up to total protection. But there is also "old-fashioned" horsepower that still includes an overload service factor —the motors actually defy abuse.

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Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc, New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Cochaud Wire Die Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die., Inc., Fort Wayne, Ind.
Hontan Corporation, Yonkers, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Hontan Corporation, Yonkers, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Union Wire Die Corp., New York, N. Y.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Hontan Corporation, Yonkers, N. Y.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Michigan.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Wire Packaging
Continental Can Company, Van Wert, Ohio

DRUMS & TRAVERSES—For Cable Reels
Entwistle, James L., Co., Providence, R. I.
Hubbard Spool Co., Garrett, Ind.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

DRYING EQUIPMENT
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Ovens, Inc., Detroit, Michigan.
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Lubricants—Hans C. Bick, Inc., Reading, Pa.
Wire Mill—Clarence S. Arms, Worcester, Mass.
Zinc—Imhoff, Wallace G. Co., Los Angeles, Calif.
Seymour, Leroy D., Trenton, N. J.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FILM—Insulating
Standard Film Products Corp., Pawtucket, R. I.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Drever Company, Phila., Pa.
Rockwell, W. S., Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worchester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.
Lignum-Viate Products Company, Jersey City, N. J.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HARDSURFACING ALLOYS—
(See Alloys—Hardsurfacing)

HOOKS—Pickling & Liming
Lewis Welding and Engineering Corp., The, Bedford, Ohio
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Carbro Chemical Company, Pawtucket, R. I.
Celanese Corporation of America, New York, N. Y.
Chemical Products Co., E. Providence, R. I.
Electronic Rubber Co., Stamford, Conn.
Heineman Corp., Oscar, Chicago, Illinois
Monsanto Chemical Co., St. Louis, Mo.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Plymouth Cordage Company, Plymouth, Mass.
Standard Film Products Corp., Pawtucket, R. I.
Synthetic Thread Corporation, Bethlehem, Pa.

INSULATING MATERIALS — Paper— For Electric Wire Cable
Plymouth Cordage Company, Plymouth, Mass.

KETTLES—Galvanizing
National Annealing Box Co., Washington, Pa.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
Chemical Products Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.
Ironsides Co., The, Columbus, Ohio

LUBRICANTS—for Metal Cutting, etc.
Ironsides Co., The, Columbus, Ohio

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Bobbin Winders
Mummert-Dixon Company, Hanover, Pa.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co Philadelphia, Pa.
New England Butt Co., Providence, R. I.
New York Engineering Co., Yonkers, N. Y.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Centerless Grinding
Schumag Schumacher Metallwerke, Aachen, Germany.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Diameter Testing Continuous
Standard Electronic Research, New York, New York.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Ovens, Inc., Detroit, Michigan
Rockwell Co., W. S., Fairfield, Conn.

MACHINERY—Extruding
Davis-Standard Sales Corp., Mystic, Conn.
Entwistle, James L., Company, Providence, R. I.
Modern Plastic Machinery Co., Lodi, N. J.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Blashill and Company, Arthur, Worcester, Mass.
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.

MACHINERY—Flat Wire
Fenn Manufacturing Co., Newington, Conn.
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Michigan Ovens, Inc., Detroit, Michigan
Modern Plastic Machinery Company, Lodi, N. J.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.
Michigan Ovens, Inc., Detroit, Michigan

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.
Mummert-Dixon Co., Hanover, Pa.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Company, Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, James L., Company, Providence, R. I.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pickling
Lewis Welding & Engineering Corp., The, Bedford, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used). New York.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Pumps for Molten Metal
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Re-Spooling
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Davis Electric Company, Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Mummert-Dixon Co., Hanover, Pa.
National Mach'y Exch. (Used), New York.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill
Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Schumag Schumacher Metallwerke, Aachen, Germany

MACHINERY—Rolling Mill
Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
Modern Plastic Machinery Co., Lodi, N. J.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Fidelity Machine Co., Phila., Pa.
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing
Davis Electric Company, Wallingford, Conn.
Entwistle, James L., Company, Providence, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Modern Plastic Machinery Co., Lodi, N. J.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Straightening & Cutting
Continental Fdy & Machine Co., Medart Division, Pittsburgh, Pa.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Fenn Manufacturing Co., Newington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
American Insulating Mach'y Co., Phila., Pa.
Blashill and Company, Arthur, Worcester, Mass.
Davis Electric Company, Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Entwistle, James L., Company, Providence, R. I.
Federal Manufacturing Co., Wallingford, Ohio
Fenn Manufacturing Co., Newington, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Modern Plastic Machinery Co., Lodi, N. J.
New York Engineering Co., Yonkers, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Federal Manufacturing Co., Wallingford, Ohio
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Turks Head
Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Company, Wallingford, Conn.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot)

MACHINERY—Welded Wire Fabric
Maschinen & Stahl, A. G., Entwicklungs Verwertungs Gesellschaft Switzerland

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Winding Wire
Emory, Robert J., Newark, N. J.
Entwistle, James L., Company, Providence, R. I.
Fenn Manufacturing Co., Newington, Conn.
Mummert-Dixon Co., Hanover, Pa.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Wire Drawing
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fenn Manufacturing Co., Newington, Conn.
Herborn, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
Morgardshammers Mek Verstads AB, Morgardshammer, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Schumag Schumacher Metallwerke, Aachen, Germany
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Ovens, Inc., Detroit, Michigan
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Spelter, Galvanizing, Lead
National Annealing Box Co., Washington, Pa.

PAPER—Creped Wrapping
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—Insulating
Plymouth Cordage Co., Plymouth, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Lewis Welding and Engineering Corp., The, Bedford, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio

PICKLING TANK LININGS—
Haveg Corp., Newark, Del.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICS—for Wire Insulation
Electronic Rubber Co., Stamford, Conn.
Monsanto Chemical Co., St. Louis, Mo.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Wire Tinning
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

REEL AND TENSION STANDS—
Davis Electric Company, Wallingford, Conn.
Fidelity Machine Company, Inc., Philadelphia
Industrial Ovens, Inc., Cleveland, Ohio.
New York Engineering Co., Yonkers, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS—Plywood
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wooden
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RETORTS—Annealing
National Annealing Box Co., Washington, Pa.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Steel
Crucible Steel Co. of America, Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Titan Metal Manufacturing Co., Bellefonte, Pa.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

ROLLS—Wire Straightening
Lignum-Vitae Products Corp., Jersey City, N. J.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURANTS—Cable
Carbro Chemical Company, Pawtucket, R. I.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SHEAVES—Wood
Lignum-Vitae Products Corp., Jersey City, N. J.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

TANKS—Compound
National Annealing Box Co., Washington, Pa.
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
National Annealing Box Co., Washington, Pa.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.
Wire Equipment Mfg. Co., Trenton, N. J.

TOOLS—Wire Cutting
Porter, H. K. Inc., Somerville, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES & LACQUERS—for Electric Wire
Carbro Chemical Co., Pawtucket, R. I.
Chemical Products Co., E. Providence, R. I.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Maschinen & Stahl., A. G., Entwicklungs Verwertungs Gesellschaft Switzerland
Micro Products Co., Chicago, Ill.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass
Chase Brass & Copper Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Brush
Spencer Wire Corp., Union, N. J.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.
Utica Wire Corp., Derby, Conn.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Titan Metal Manufacturing Co., Bellefonte, Pa.
Wickwire Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.
Utica Wire Corp., Derby, Conn.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
North American Philips Co., Inc., Elmet Division, Lewiston, Me.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.
U. S. Steel Corp., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
Spencer Wire Corp., Union, N. J.

WIRE—Needle
Carpenter Steel Company, Webb Wire Division, New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.

WIRE—Special Shapes
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Spring
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Carpenter Steel Company, Webb Wire Div., New Brunswick, N. J.
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
Major Co., J., Chicago, Ill.
National Lock Washer Company, The, Newark, N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Major Co., J., Chicago, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N J.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Major Co., J., Chicago, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.
Utica Wire Corp., Derby, Conn.

WIRE—Tungsten
North American Philips Co., Inc., Elmet Division, Lewiston, Me.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.
Lignum-Vitae Products Corp., Jersey City, N. J.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Celanese Corporation of America, New York, N. Y.
Heineman Corp., Oscar, Chicago, Illinois
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Standard Film Products Corp., Pawtucket, R. I.
Synthetic Thread Corporation, Bethlehem, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE AND MASTICATING MACHINERY MANUFACTURERS

WATSON

TRACTOR CAPSTANS

AS BUILDERS OF TRACTOR CAPSTANS FOR ALMOST TWENTY YEARS WE NOW OFFER OUR LATEST DESIGN WITH ADVANTAGES AND IMPROVEMENTS WHICH GO FAR BEYOND THE ORIGINAL SIMPLE REQUIREMENT TO HAUL CABLES, WIRE ROPE, HOSE POLES AND OTHER LINEAR PRODUCTS WITHOUT BENDS.

OUTSTANDING POINTS OF ADVANTAGE ARE:

1—*RAPIDITY* OF ALL ADJUSTMENTS WHILE IN OPERATION OR AT STANDSTILL.

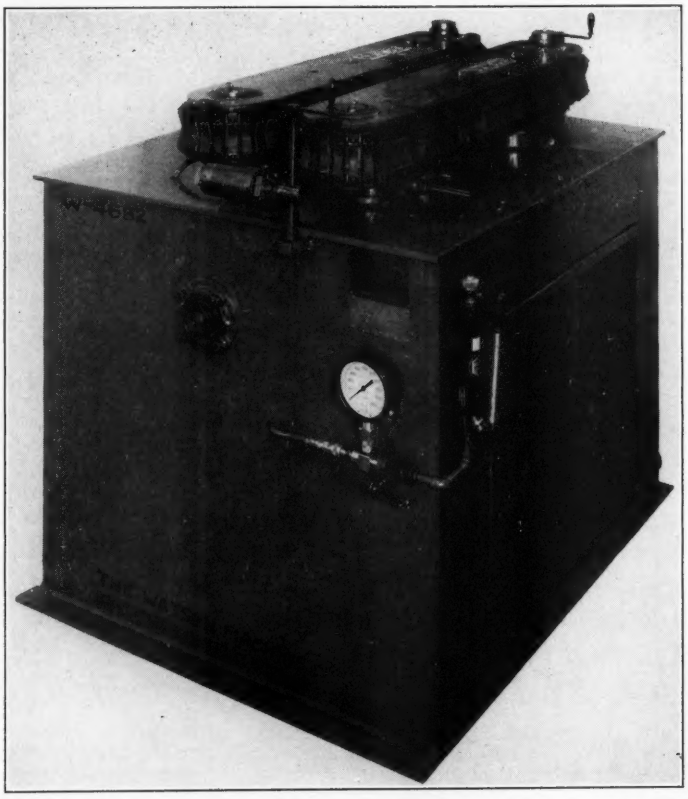
2—*EASE* OF UNOBSTRUCTED CABLE INSERTION OR REMOVAL AT A CONVENIENT OPERATING HEIGHT.

3—*SPACE SAVING* BY COMPACT DESIGN. PERMITS INSTALLATION OF HEAVY DUTY UNITS WHERE SPACE FOR LARGE SINGLE OR DOUBLE WHEEL CAPSTANS OF COMPARABLE HAUL PULL IS NOT POSSIBLE.

4—*HYDRAULIC* PRESSURE APPLICATION, WIDTH ADJUSTMENT AND RELEASE BY SIMPLE HAND PUMP AND VALVE OPERATION.

5—*READABILITY* OF ACTUAL PRESSURES AND HAUL PULL BY GAUGE AND TRANSLATOR.

6—*INTERCHANGEABILITY* OF TRACTOR FACINGS TO SUIT THE CONTOUR (SUCH AS SECTORS, ETC.) OF ANY PRODUCT AND A *VARIETY* OF FACING MATERIALS FROM SOFT RUBBER AND TEXTILE MATERIALS TO HARDENED STEEL OR TUNGSTEN CARBIDE FACINGS.



7—*AUTOMATIC* CENTERING BETWEEN AND SELF-ALIGNMENT OF THE TRACTORS.

8—*BOTH TRACTORS* ARE DRIVEN AND PRESSURE IS *UNIFORM* ALONG ENTIRE TRACK LENGTH.

9—*SPEED VARIATION* WITHIN REQUIRED RANGE IS *STEPLESS* BY HANDWHEEL AND INDICATOR DIAL, OR STEPPED BY MEANS OF CHANGE GEARS.

10—*SELF-POWERED* OR *LINE SHAFT* DRIVEN TO SUIT USERS PARTICULAR REQUIREMENTS.

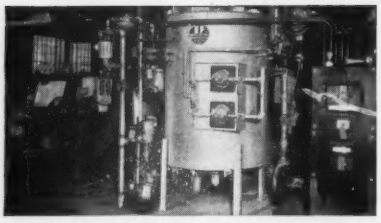
AVAILABLE IN SIZES FOR 4" AND 6" MAXIMUM DIA. CABLES.

No. W-4682 IS A 4" UNIT, SELF-POWERED AND CAPABLE OF HAUL PULLS TO 3,000 POUNDS.

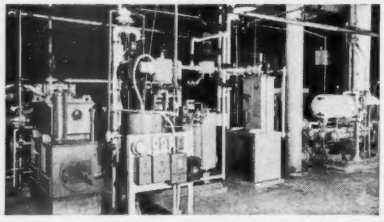
5-55

Special Atmosphere equipment

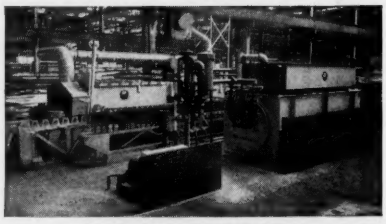
Get the exact surface characteristics you want, with unvarying uniformity day after day, with EF special atmosphere equipment. Complete facilities. Designed and ruggedly built for efficient, low cost operation. Proven in exacting service on hundreds of important installations. Sizes for any capacity. Submit your special atmosphere and furnace requirements to EF's experienced engineers — it pays.



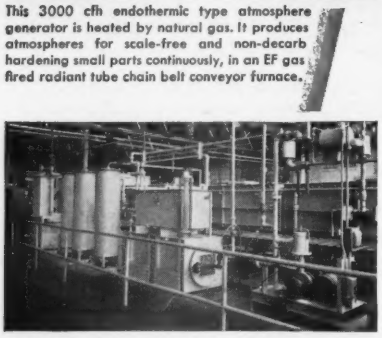
This 3000 cfh endothermic type atmosphere generator is heated by natural gas. It produces atmospheres for scale-free and non-decarb hardening small parts continuously, in an EF gas fired radiant tube chain belt conveyor furnace.



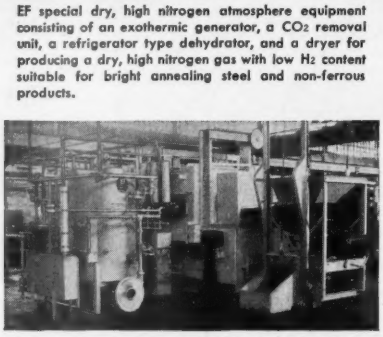
EF special dry, high nitrogen atmosphere equipment consisting of an exothermic generator, a CO_2 removal unit, a refrigerator type dehydrator, and a dryer for producing a dry, high nitrogen gas with low H_2 content suitable for bright annealing steel and non-ferrous products.



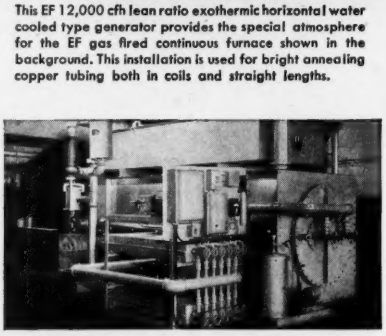
This EF 12,000 cfh lean ratio exothermic horizontal water cooled type generator provides the special atmosphere for the EF gas fired continuous furnace shown in the background. This installation is used for bright annealing copper tubing both in coils and straight lengths.



A lean ratio EF exothermic gas generator, with desulphurizers and refrigerator, produces the special atmospheres for the EF continuous bright annealing furnace shown in background. This installation is in a large copper and brass wire mill.



This EF special atmosphere generator has special adaptor to enable it to operate either as an exothermic or endothermic generator. It is used in connection with the continuous EF bolt hardening furnace at right, for scale free hardening or for carbon restoration.



EF kerosene exothermic generators are available in various sizes and types for areas where gaseous fuels are not obtainable. This 12,000 cfh kerosene unit is shown undergoing our regular factory tests, prior to shipment to South America for use with EF furnaces for bright annealing copper and scale-free annealing brass.

● EF engineers pioneered the development and the use of endothermic, exothermic and other low cost special atmosphere treatments for bright annealing ferrous and non-ferrous strip, tubing, wire and other products; for scale-free hardening, carbon restoration, decarburization and other treatments. The complete line includes endothermic and exothermic generators, ammonia dissociators, refrigerators, dryers, desulphurizers, gas scrubbing units, CO_2 removal units and other needed equipment. Automatically controlled. For the utmost in efficient, low cost operation consult EF engineers, headquarters for special atmosphere equipment — and heat treating furnaces.

EF

THE ELECTRIC FURNACE CO.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem - Ohio

Canadian Associates • CANEFCO, LIMITED • Toronto 1, Canada